LONG-RANGE MISSILES:
COMPLETE AND HAPPY VICTORY?

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13. ABSTRACT (Maximum 200 words)
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The principal conclusion is that, although LRMs have shown utility as a form of indirect fire to support maneuver, their primary employment has been neither to support maneuver nor to intimidate by themselves. Instead, they have been used in attritional air campaigns which, with one exception, did not seek to capitalize on the attrition inflicted with follow-on exploitation. The thesis reveals that LRM use has mainly been a form of attrition without exploitation, and reinforces current theories that exploitation should be defined and emphasized as a principle of war.

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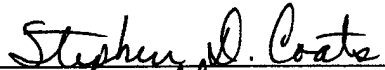| 17. SECURITY CLASSIFICATION OF REPORT UNLCASSIFIED	18. SECURITY CLASSIFICATION UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UL

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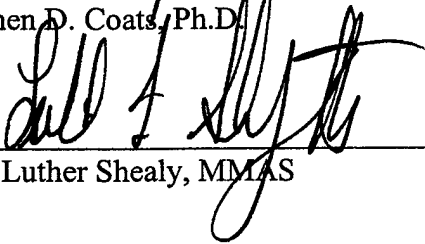
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ii

ABSTRACT

LONG-RANGE MISSILES: COMPLETE AND HAPPY VICTORY? by LCDR Jennifer E. Dyer, USN, 141 pages.

This thesis examines the employment of long-range missiles, such as the Tomahawk Land Attack Missile and the Army Tactical Missile System, in U.S. military operations from Operation DESERT STORM to the present. The thesis reviews long-range missile (LRM) employment at the tactical, operational, and strategic levels of war, from the perspective of the question whether LRMs enable the user to compel an enemy to give up his purpose, while minimizing harm to own forces. LRMs are evaluated as a form of indirect fire supporting maneuver, and as a method for intimidation on the Douhetan airpower model.

The principal conclusion is that, although LRMs have shown utility as a form of indirect fire to support maneuver, their primary employment has been neither to support maneuver nor to intimidate by themselves. Instead, they have been used in attritional air campaigns which, with one exception, did not seek to capitalize on the attrition inflicted with follow-on exploitation. The thesis reveals that LRM use has mainly been a form of attrition without exploitation, and reinforces current theories that exploitation should be defined and emphasized as a principle of war.

TABLE OF CONTENTS

ABBREVIATIONS

AAA — Antiair Artillery

ASCM — Antiship Cruise Missile

ATACMS — Army Tactical Missile System

C2 — Command and Control

CALCM — Conventional Air-launched Cruise Missile

FSCL — Fire Support Coordination Line

GPS — Global Positioning System

HARM — High-speed Antiradiation Missile

IADS — Integrated Air Defense System

ICBM — Intercontinental Ballistic Missile

IW — Information Warfare

JFACC — Joint Force Air Component Commander

JFC — Joint Force Commander

JSTARS — Joint Surveillance Target Attack Radar System

JTTP — Joint Tactics, Techniques, and Procedures

LRM — Long-range Missile

MLRS — Multiple Launcher Rocket System

NCA — National Command Authorities

NFZ — No-fly Zone

PGM — Precision-guided Munition

RMA — Revolution in Military Affairs

SAM	Surface-to-Air Missile
SEAD	Suppression of Enemy Air Defense
SLCM	Ship-launched Cruise Missile
TACAIR	Tactical Aircraft
TASM	Tomahawk Antiship Missile
TLAM	Tomahawk Land Attack Missile
TLAM-C	Tomahawk Land Attack Missile - Conventional Warhead
TLAM-N	Tomahawk Land Attack Missile - Nuclear Warhead
TTP	Tactics, Techniques, and Procedures

CHAPTER 1

INTRODUCTION

From the earliest days of warfare, man has sought to develop and employ weapons that enable the striking of opponents from beyond the opponent's "circle of lethality."[1] Every practitioner of war has counted it success to destroy the opponent's force, or to disrupt the opponent's operations, with minimum exposure of friendly troops to enemy fire. From a grand strategic standpoint,[2] moreover, minimizing own troops' exposure to enemy weapons has become, in this century, one of the foremost considerations for Western political leaders in committing to a military course of action. The carnage of two world wars has made many Western leaders sentimental, even more than practical, adherents to the dictum articulated by the late-Roman General Belisarius: "The most complete and happy victory is this: to compel one's enemy to give up his purpose, while suffering no harm to oneself."[3]

The proposed method for securing this happy victory has, in varying circumstances throughout history, been based on operational art (e.g., Sun Tzu), technological solutions (the longbow, the siege cannon, the rifled musket), and combinations of the two (as, for example, Giulio Douhet's uniting of the Napoleonic art of attacking centers of gravity with the technological solution of the airplane). Thirteen centuries after Belisarius, popular--even professional--imagination envisions compelling enemies to give up their purposes through a wide range of effects, from the nonlethal use of information to the use of precision-guided missile launched at an enemy from long range--that is, from well outside the enemy's circle of lethality.

1

Long-range, precision-guided missiles, such as the Army Tactical Missile System (ATACMS) and the Navy Tomahawk Land Attack Missile (TLAM), are considered by military thinkers to be defining products of the information revolution. In a signature series of U.S. Army War College monographs on the modern revolution in military affairs (RMA), Dr. Michael J. Mazarr states unequivocally that, "The revolution in military affairs underway today is, of course, the revolution in information, sensing, and precision strike technologies."[4] Like other products of this revolution, whether digital imaging, instantaneous communications, or automated data analysis, the long-range missile is suspected of being a tool for gaining disproportionate advantages in combat.

Although the weapon is expected to have a compelling effect on the enemy due to its lethality, the long-range missile is also classed with information tools due to the decreased risk it promises to own military forces.[5] This combination of features makes the long-range missile particularly attractive to both military operational and civilian strategic decision makers. Even analysts who do not agree that information technology by itself will be an effective agent of compulsion will admit that missiles exert the conventional, still-respected industrial-age[6] force of blowing things up.[7] Conversely, information-oriented planners, such as national leaders, are reassured by the comparatively low risk of employing such weapons to the safety of their citizens in arms. Long-range missiles seem to offer a state-of-the-art method of achieving Belisarius' happy victory, and are referred to more and more often by popular and professional pundits alike as "the weapon of choice."[8]

During the 1990s, missile systems that offer the benefit of inflicting damage with relative impunity have been tested, under at least some of the real-world conditions in which they might be expected to yield maximum advantage. Their advantages are no longer merely speculative; it is now possible to investigate their track record, and draw some conclusions--however tentative--about the extent to which they contribute to delivering Belisarius' complete and happy victory. Does the use of these missiles measurably improve their users' chances of compelling an enemy to give up his purpose while minimizing harm to themselves? If so, how is this improvement realized? Do the missiles exert a particular, missile-unique, compelling force in and of themselves, or do they improve the mechanism of military compulsion as one among several contributing factors? Is their contribution uniform across the historical record of conflict, and at all levels of war? Can long-range missiles supplant higher-risk forms of engagement as a tool of war while achieving the same or better effect?

This thesis investigates these questions through the vehicle of the historical record. Fundamentally, it inquires into the effectiveness of long-range missiles in compelling opponents of the United States to give up their purposes, while minimizing the risk to our own forces, in conflicts since Operation DESERT STORM. It seeks to determine what effect their use had on the progress of the campaign. Missile effects which, either partially or completely, compelled the enemy to give up his purpose, are ultimately refined into lessons for warfighting through the prism of the principles of war enunciated in U.S. joint doctrine.[9]

Approaching the questions of this thesis with appropriate rigor necessitates a set of basic assumptions and definitions. For definitions, the thesis relies primarily on commonly accepted terms from joint doctrine and professional literature, referenced as necessary for clarity. These terms include the principles of war from Joint Pub 3-0, which will appear throughout the text in italics, and the three levels of war (strategic, operational, and tactical), also as defined in Joint Pub 3-0. (A glossary provides definitions of these terms.) In addition, a set of terms must be defined specifically for the purpose of the thesis. This set includes the concept of "comparable lethality" of weapon systems, and terms relating to the key expression "long-range missile."

There is a great variety of missiles being produced and used throughout the world, and the focus of this thesis is on missiles which produce a conventional destructive effect when delivered from outside the "comparable lethality" circle of the opponent. Comparable lethality is defined as encompassing methods of lethal counterattack which parallel those of the attacking force in one or more of the following: destructive capacity, means of delivery, range of effect, or reciprocal choice of target. A bomber aircraft carrying short-range laser-guided bombs might be considered comparable in lethality to a long-range battlefield missile, if the air force employing the bomber has air superiority in the combat area. However, if the bombing air force cannot achieve an effect because of the threat to the aircraft, then the comparable lethality advantage goes to the missile.

Similarly, a naval cruiser launching a long-range land attack missile could be inside the circle of comparable lethality of the country under attack, and thus at risk, if it launches from a position within the threat radius of the target country's coastal missile

4

defense system. However, even if the attacking naval cruiser launches from further off the coast, it may still be susceptible to counterattack by the target country's diesel submarine force. In this case, the attacking navy must position its cruiser at a considerable distance from the target country in order to escape that country's circle of comparable lethality.

An example of noncomparable lethality, on the other hand, would be the case of a country which sponsors international terrorism, and chooses to counterattack, in response to a missile attack, by initiating terrorist activity against the attacker's population. This form of counterattack, usually termed "asymmetry," is noncomparable because the targets, means of delivery, and purpose (political versus military) are dissimilar.[10]

Beyond comparable lethality, the following definitions will support development of this thesis. Specifically, they are definitions of the terms long-range, missile, unmanned, and precision guided. Intercontinental ballistic missiles (ICBMs), it should be noted, are not considered long-range missiles for the purpose of this study. Their intended use and effect make them a separate class of weapon. The missiles considered together in this study have in common their nonnuclear warheads, their design for attack at the operational or tactical level, and their range relationship (but not absolute range) to the battle or target area.[11]

The class of weapon this study focuses on has four key characteristics:

1. It is a long-range weapon, relative to the launch platform and/or the geographic area of the deep battle in a given campaign. Long-range is not tied to an absolute number of kilometers or miles, but is distinguished by a relative relationship to battle areas and

counterthreat ranges. It should be noted that U.S. Joint Force doctrine does not provide a single or specific definition of long-range as it applies to missiles. In the DoD Dictionary of Military and Associated Terms (Joint Pub 1-02, 1994), long-range is typically contextual (i.e., signifying one thing in relation to sonar and another in relation to bomber aircraft); and where long-range is defined, as in the case of generic aircraft, the definition is for the purpose of categorizing weapon systems according to their capabilities, to support procurement planning. Thus, the meaning of long-range proposed in this thesis does not contradict an existing joint definition.

ATACMS is a good example of a long-range weapon examined for the purpose of this thesis. ATACMS' range (up to 280 kilometers/170 statute miles for the Block IIA variant) allows the imposition of fires effects on the deep battle area. Where friendly air superiority exists in an operational theater--that is, where enemy aircraft are denied the ability to countertarget friendly launch systems--ATACMS can be launched from outside the circle of the enemy's comparable lethality.

A second example is the Tomahawk Land-Attack Cruise Missile (TLAM), with a range of 1800 kilometers/1100 statute miles for the Block III variant. Not all cruise missiles are true long-range weapons for the purpose of this thesis. From a naval perspective, for example, most sea-launched antiship cruise missiles (ASCMs), such as the U.S. Harpoon or French Exocet, are really close battle weapons. Since the first successful employment of an ASCM--when the Egyptian navy sank the Israeli warship *Eilat* with a Soviet-made STYX missile in the 1967 war--ASCMs have been so widely developed and improved that naval doctrine now expects to fight at sea using missiles,

over ranges commonly extending from 24 to 60 statute miles. Thus, in this instance, the missile produces no disproportionate advantage in and of itself. To the contrary, it is a bare necessity for tactical engagements.

TLAMs, however, are used exclusively on targets beyond the close battle of the launching platform and typically for strategic and operational interdiction of enemy capabilities beyond the projected or actual zone of tactical engagement (i.e., from the operational perspective, beyond the close battle). Thus, both ATACMS and TLAMs are long-range missiles in relation to the areas of operations (AOs) for which their employment produces effects. Moreover, TLAMs can be launched at such a great distance from targets that only a few well-equipped militaries possessing ocean-going navies or long-range aircraft can threaten TLAMs' launch platforms.

2. The weapon is a missile, either cruise or ballistic. This essentially means that it is not a bomb. Bombs, whether guided or free-fall, are not under consideration in this thesis. Since they are delivered by aircraft that must come in close to the target, they do not meet the first criterion of being long-range based on the circle of lethality of the adversary. In the assumed operational conditions of nation-state warfare, bomber aircraft cannot deliver bombs from short range without entering a typical enemy's circle of lethality, either from anti-aircraft artillery (AAA), interceptor aircraft, or anti-air missiles. Missiles, on the other hand, follow an independently impelled trajectories or powered flight paths, and allow launch platforms to launch them from outside of a typical enemy's comparable lethality circle.

3. The weapon is unmanned. It is delivered, in all cases (ground, sea, or air launched), from a manned platform, but because of the weapon's range, the manned launch platform can remain at a comparatively great distance from the impact area. What actually approaches the target and potentially enters the envelopes of the enemy's circle of lethality is an unmanned vehicle.

4. The weapon is precision guided. For the purpose of this thesis, the defining element of precision guided is guidance referenced to predetermined geospatial points. By contrast, a sensor-guided weapon may distinguish levels of infrared emanations to select its target or may home on the target's radar, regardless of the target's position relative to a reference point. A purely precision guided weapon, however, finds its target based on designated geospatial reference points. These points may be as elaborately preplanned as in the terminal guidance imagery scenes used by TLAMs or as simple as the digital input of latitude and longitude, compared in flight with real-time updates from the global positioning system (GPS). The common element is the missiles' dependence on geospatial reference for guidance, however the orientation to that reference is processed.

A precision guided weapon may incorporate sensor guidance, as the ATACMS Block IIA does. Though its precision guidance comes from its GPS-inertial guidance capability, the ATACMS Block IIA also includes acoustic, infrared, and millimeter wave sensors for terminal homing. However, to be considered precision guided, the weapon must orient itself to its target either initially or primarily by proceeding toward a predetermined spatial reference point.

8

To summarize, then, the weapon to be examined in this thesis is a long-range missile, it is unmanned, and it is precision-guided. It is expected, for planning purposes, to have the advantage of being launched from outside the opponent's circle of comparable lethality. The term long-range missile, abbreviated LRM, will be used to signify this type of missile for the remainder of the thesis, to enhance brevity and readability. The following U.S. missiles meet the criteria of the thesis definition: TLAM, ATACMS, and the Conventional Air-Launched Cruise Missile (CALCM) employed by the U.S. Air Force.[12]

In addition to terms, four basic conceptual assumptions form the foundation of this thesis. Two of those assumptions essentially delimit the scope of inquiry; the other two are the fundamental building-blocks of the final analysis.

The first of the delimiters is the use of the expression "operational effectiveness." This thesis investigates the effectiveness demonstrated by LRMs in contributing to the accomplishment of an objective. The objective may be relevant at the strategic level of war, such as compelling an opponent to give up his purpose. It may be a tactical objective, such as causing an enemy to retreat or halt in place. In this thesis, operational effectiveness is defined as missile effectiveness for achieving such objectives, rather than simple physical effectiveness at hitting and destroying targets. This distinction acknowledges that a missile may be physically effective (that is, it may hit and damage a target) without achieving an operational objective such as eliminating the enemy's integrated air defense system (IADS) capability. The performance of LRMs as measured by physical destructive capacity is a separate issue. This thesis relies on previous

9

assessments of LRMs' physical effectiveness as a baseline for pursuing the question of operational effectiveness.

It should also be noted that operational effectiveness is not tied to the operational level of war. The terminology as used here indicates an LRM's effectiveness in contributing to the achievement of objectives, which may be strategic, operational, or tactical. The adjective operational is used to distinguish this effectiveness from physical effectiveness. Wherever "operational effectiveness" is used, it has the LRM-specific meaning defined here; generic combat effectiveness at the operational level of war is referred to as "effectiveness at the operational level of war."

The second delimiter concerns the concept of risk to own forces. This thesis assumes that LRMs have reduced risk, compared to the risk involved in attacks from within an opponent's circle of lethality, as a defining characteristic. Thus, comparative risk reduction is assumed to accompany the use of LRMs. This premise is the single most consistent assumption of missile literature.[13] Although the factor by which risk is actually reduced, given situational alternatives, is not the focus here; there will be no attempt to quantify the risk differentials of, for example, LRMs versus manned bombers or LRMs versus special operations forces, as tools of deep attack. Such differentials undoubtedly exist and are probably quantifiable, but they are not the central issue for this thesis. Instead, the reduction of risk is assumed to be a factor in the decision to employ LRMs; an assumption which is invariably supported by both historical and theoretical literature. One of the aspects of LRMs which is least in doubt is the reduction in own-force risk associated with their use. Therefore, in terms of Belisarius' aphorism, the

10

emphasis in this thesis is on determining whether and in what way the enemy was compelled, rather than on whether harm to own forces was reduced.

Two final assumptions create the parameters for analysis in this thesis. The first is an assumption about the comparability of LRM effects at different levels of warfare. The second is an assumption about assumptions: specifically, the assumptions made by decision makers who opt to employ LRMs in a given situation.

Because long-range, precision-guided missiles have been used relatively seldom, and because their use has occurred at all levels of war (strategic, operational, and tactical), a study of their effects is most useful if it incorporates results from all levels of war for which there is information. Limiting the study to the tactical level of war, for example, would result in the inclusion of only the smallest data set: the use of ATACMS during DESERT STORM. On the other hand, choosing to evaluate only the strategic-level missile strikes performed with TLAMs, such as the U.S. attacks on Iraq in 1993 and 1996, would eliminate the information obtainable from a study of the operational-level attacks conducted with cruise missiles during DESERT STORM and Operation DELIBERATE FORCE in Bosnia.

For the purpose of this thesis, it is thus assumed that there is enough commonality in the aspects of LRM use at all three levels of war that examples from each level may be usefully considered in conjunction with each other. A realistic illustration of the motives and expected results, associated with using LRMs at different levels of war, confirms that this assumption is valid. As the examples indicate, the advantages offered by LRMs--the

11

ability to precisely strike specific high-payoff targets, and comparatively low risk--are relevant to all levels of warfighting.

For example, a strategic use of LRMs might be to employ them against a foreign country's early warning infrastructure, to compel that country to give up a hostile purpose, such as aggression against its neighbor. The purpose of missile attacks--to influence a country's political decision--is strategic. The missiles are used to attack a center of gravity: the victim's ability to react successfully to external threats. The principle underlying the use of LRMs is that they will achieve the desired effect while placing the fewest friendly troops at risk. If the same effect could only be achieved through manned aerial bombardment, or even more dangerously, through invasion and occupation of the target country, this higher cost would in most cases materially alter the strategic decision. Moreover, the result achieved by the missile attack can be stated in terms of what the enemy is compelled to do or not do--in this case, abandon his aggression against a neighbor.

The same purpose may be in evidence at the tactical level of war. If an army commander uses ATACMS to attack enemy antiair artillery (AAA) positions, he has a tactical purpose: to deny the enemy its ability to shoot down his close air support and surveillance aircraft. He is attacking a weapon system that can count heavily in the enemy's--and his--calculus of relative combat power in the battle area. The use of LRMs enables the army commander to achieve his purpose with considerably less risk to his soldiers than otherwise. If taking out the AAA sites required committing infantry or moving regular artillery into counterbattery range, the commander's emphasis on

12

destroying the antiair weapons would probably be attenuated. The resulting vulnerability of friendly air support would probably affect the commander's decision on when and where to fight. Finally, assuming that eliminating the enemy's AAA capability is a principal means of compelling the enemy to give up his defense of the territory in question, the result of an ATACMS attack can be evaluated in terms of how it contributes to compelling the enemy to give up his purpose.

In these examples, although the purposes and types of targets differ, LRMs offer a solution with common advantages--namely, an ability to precisely strike specific high-payoff targets, and a comparatively-low risk--and have similar effects on the likelihood of pursuing a course of action (the advantages make pursuit more likely). Their results can also be assessed using similar criteria regarding compulsion of the enemy. The approach in this thesis will be to evaluate such common elements of compulsion, where they can be distinguished and validated, across the levels of war.

The second fundamental assumption of this thesis is that LRMs are used in the context of an assumption (not always stated) about the type of force they represent, and that that force is held to be specific to LRMs. As discussion of the existing literature will show, there is a professional military--as well as theoretical or academic--body of assumptions about LRMs. While these assumptions are seldom articulated either in professional writing or at the point of operational decision, the patterns of LRM use suggest they infuse the thinking of military planners and analysts as well as the national command authorities (NCA).

Fundamentally, the assumptions in question turn on one's interpretation of the basic function of LRMs as a tool of force, and what utility one therefore mentally assigns them. The LRM's function is essentially evaluated in one of two ways. In one view, it is a form of battle-oriented indirect fire, which serves to facilitate the operations of maneuver forces. In the other, the modern LRM is considered a more-agile descendant of the Cold War-era intercontinental ballistic missile (ICBM)--a weapon of intimidation that may actually supplant conventional force maneuver as a means of compelling an enemy.[14] Clearly, the legacy of either of these estimates will have a profound impact on decisions about when and how to use LRMs.

The assumption of this thesis is that one or both of these suppositions influences situational decision making about the employment of LRMs. Specific aspects of each supposition are further developed in the literature review in chapter 2. Virtually all analysis of LRM utility--whether theoretical or empirical--occurs in the context of these broad suppositional constructs. For the most part, however, they are identified and articulated poorly or not at all in current missile literature, and must often be identified from indirect clues. This thesis seeks to reveal them where they are in operation, and to the extent possible, to evaluate and validate tacit assumptions LRMs, as a method of compelling an enemy, are, on the one hand, a form of indirect fire, or that they are, on the other, a form of intimidation.

The dichotomy of these two approaches to explaining the origin of LRMs serves ultimately to frame the assessment proposed in this thesis. Whether LRMs create an advantage because they facilitate ground maneuver[15] as a means of compelling an enemy,

14

or rather because they compel an enemy without the necessity for ground maneuver, is a fundamental question about many tools of modern warfare.

Long-range missiles can be readily evaluated across this continuum of theories. For example, ATACMS offers perhaps the most sophisticated version in existence of tactical indirect fire. It is an army weapon, intended to enable--but not to supplant--maneuver. At the operational or strategic level of war, the TLAM and the CALCM represent indirect fire that, in support of a ground campaign, can facilitate maneuver by destroying the enemy systems that hinder it, such as artillery command and control or well-appointed airfields.

However, the isolation of many TLAM and CALCM strikes conducted in the 1990s, in which targets were attacked as single events unrelated to an overall, sequential campaign, suggests that U.S. political and military decisionmakers have sometimes intended to produce compelling effects without resorting to maneuver. Of interest to this thesis are, first, whether such strikes were conducted in the belief that they would compel the enemy by themselves, and second, if LRMs were used because they represented the lowest-risk option.

From the vantage point of 1999, there are actual instances of post-Cold War employment of LRMs to compare with theory. This thesis examines LRM use and its results in the context of the competing indirect fire versus intimidation perspectives. A few examples will set the stage for the analysis to be done. At the tactical level, DESERT STORM showed the contribution of LRMs to prosecuting a ground war. To review the performance of missiles at the operational level, the use of TLAMs in

15

DESERT STORM and in DELIBERATE FORCE may be examined. Both contexts bear examination, for one operation, DESERT STORM, applied missiles to facilitate ground force maneuver, whereas the other used them in a virtually exclusive air campaign which had no maneuver objective. Finally, from a strategic perspective, the 1990s missile strikes on Iraq, Afghanistan, and Sudan are informative. Each of these strikes was performed without a maneuver component, and is therefore usefully evaluated in terms of an intimidation-oriented model of force.

Ultimately, when real-world LRM use at the three levels of war is considered in this context, the conclusions abstracted from each level are compared. As a final analytical tool, LRM employment may be analyzed in the context of the joint principles of war defined in U.S. doctrine. The conduct of war at all three levels of war is supposed to be guided by these principles. How well LRMs leverage their beneficial attributes, and whether the existence of LRMs indicates that any of them needs to be redefined, are questions of fundamental significance for warfighting.

The preceding sets the context in which this thesis will pose the modern question that exercises military thinkers and lay pundits alike: Do LRMs, indeed, bring us closer to Belisarius' "complete and happy victory"?

16

CHAPTER 2

REVIEW OF LITERATURE

There exists a mass of literature on subjects related to the topic of this thesis. It

ranges from the breathlessly enthusiastic to the lugubriously scientific, but it does include

some very useful works of analysis which, while few of them address the thesis question

directly, nevertheless provide a framework within which to approach it. As indicated in

Chapter 1, major analytical constructs posited for the purpose of this research include the

concept of long-range missiles as indirect fire weapons; the concept of LRM attacks as a

method of compelling an enemy through intimidation; and the question whether or not air

attacks (either by missile or manned bomber) can achieve, by themselves, the decisive

effects attributed to maneuver.

In addition to analytical context, research literature has provided general

background on the history and purpose of missiles, and principles of warfare doctrine

(including the primary recent proposals for modifications to it). Information on the

weapon effectiveness of missiles, their uses in real-world operations, and the histories and

objectives of the operations studied in the thesis is also drawn from existing literature.

The literature falls into seven basic categories. The first category is U.S. Joint

Force doctrine, as published in joint doctrine publications.[16] The second category is

governmental studies, like the General Accounting Office study of cruise missile

performance commissioned after the 1993 strikes on Iraq, and published originally in

1995. Category three is military analytical writing, which includes theses, monographs,

and professional articles by military officers, as well as commentary on doctrine found in

17

U.S. Army Command and General Staff College course material, or on websites such as that of the U.S. Army Combined Arms Doctrine Directorate. In a fourth category are books and articles, both popular and academic, by civilians writing on the military. The fifth category is the body of related papers and monographs published by independent research institutions like the RAND Corporation and the Center for Naval Analyses (CNA). A sixth category encompasses current industry reporting, as in *Jane's Defence Weekly*; and the final category is popular news reporting, in national newspapers and weekly magazines like *Time*.

Finally, the utility of websites which maintain hyperlinks to related series of data files should be mentioned. Much of the research on national command authority statements regarding the Clinton missile strikes has been facilitated by these links, like those assembled on the web server of the Federation of American Scientists.[17] Although the specific citations for individual data files reflect the servers they reside on, future researchers may be encouraged by the ease with which hyperlinked web-browsing enables the thesis writer to accumulate information.

The literature review draws on existing analysis to create a framework for answering the thesis question. However, it also highlights specific deficiencies in commentary on the subject of the thesis. These deficiencies are primarily a result of failure to explicitly categorize missiles for evaluation as types of force--that is, force exerted conventionally through indirect fire and maneuver, or force exerted through intimidation, as conceived in the post-atomic age. This categorization is often done

tacitly, with the authors failing to examine their own premises. This can reduce the value of their conclusions, although their facts and analysis may be of use.

There are many valuable and well-researched studies of airpower, which bears directly on LRM theory in some of its aspects. Missiles have been widely discussed since their first invention, and mostly in the context of a Douhetan approach to force employment--that is, considering missiles, as airpower weapons, to be principally useful for the intimidation of populations through terror (or at least the fear of catastrophic economic loss).[18] While the proponents of airpower tended to resist associating their discipline with missiles--at least with LRMs, which obviate the need for manned delivery platforms--Cold War perceptions intensified the Douhetan aura around missiles. Almost without rigorous thought, the capacity for intimidation without ground maneuver was eventually attributed peculiarly to missiles, with any missile--from ICBM to short-range tactical missiles--being considered to possess it. This unstated premise pervaded the comprehensive academic studies of both ballistic and cruise missiles compiled in the 1970s and 1980s.[19] The acceptance of this assumption, for the most part unexamined, has isolated missile analysis from the debate LRMs belong in: that between the necessity of conventional force maneuver in addition to indirect fire to compel an enemy, and the argument that indirect fire alone can achieve this objective. The remainder of chapter 2 summarizes the literature that does exist, laying the groundwork for a synthesis of the facts to be achieved in this thesis.

To begin with, regarding the weapons effects achieved by missile attacks, seminal studies have been commissioned by the U.S. General Accounting Office, including its

Operation DESERT STORM: Evaluation of the Air Campaign and its 1995 study of

cruise missiles. These studies focused more on whether, and how effectively, individual

weapons hit their targets, than on what effect this performance then had on the success of

the campaign.[20] When an LRM's effect on the campaign is addressed, it is typically

summarized as being the contribution of daylight strike capability which did not waste

manned aircraft sorties, or unduly expose them to counterfire.[21] This approach assumes

an operational advantage before investigating the actual effect of the weapon, which

introduces a systemic limitation (one acknowledged by the analysts) on the conclusions

to be drawn from the studies' organic analysis. However, the studies provide a large

amount of data which may be sifted in other ways, and can thus be used quite profitably

for this thesis even if their highlighted conclusions are at best only partially relevant.

An additional area of deficiency is the overall lack of a rigorous approach to

evaluating the use of cruise missiles in the U.S. strikes of the 1990s. Commentary, even

among military thinkers, can alternate more between enthusiastic speculation and lament

than between factual analysis and unsentimental assessment. Political opinion often

dominates the professional as well as the lay press: *Jane's* and *Aviation Week and Space*

Technology, for example, are more likely to editorialize about the political implications

of missile strikes than to evaluate them as military actions. Nevertheless, the open press,

and its cataloguers on the Worldwide Web, are excellent sources of information on

individual strikes, including the objectives stated by U.S. National Command Authorities

(NCA) and the targets attacked.

With respect to the 1990s missile strikes, the most significant deficiency is perhaps the lack of published (unclassified), methodical analysis of their effectiveness, especially after DELIBERATE FORCE in 1995. Three of the six strikes--on Iraq in September 1996, on Afghanistan and Sudan in August 1998, and on Iraq in December 1998--have occurred since that analytical cut-off. Moreover, even the published analysis of the 1993 and DELIBERATE FORCE strikes was less detailed than that provided for the missile strikes in DESERT STORM. It is necessary to rely to some extent on extrapolations from the more comprehensive analysis of the DESERT STORM studies, and on classified information which can only be referenced in this thesis as unclassified conclusions.

The deficiencies cited here relate primarily to evaluation of LRMs, as distinct from the broader categories they may fall into like indirect fire or airpower. Precisely because LRMs have become a weapon of choice for certain national objectives, however, this thesis proposes that there is merit in studying them individually, in their applications at all levels of war. From the perspective of strategic interdiction they may simply be components of airpower. But from the perspective of the U.S. NCA in 1993, 1996, and 1998, they were the only forms of indirect fire and airpower--indeed, the only forms of military force application--considered suitable for the pursuit of significant strategic objectives.

In that context, the review of literature opens with the first tier of sources approached: the general missile studies, which detail the history of and motivations for LRM development. The history of LRM development is both convoluted and arguable,

21

at least from the standpoint of explaining why the current inventory of LRMs has been accumulated. Tracing today's weapons directly through their parent procurement programs is not always helpful, as the ancestry of the TLAM attests. The TLAM, now the virtual standard of the versatile land-attack missile, is actually an offshoot of the Tomahawk Antiship Missile (TASM), which the Navy conceived a need for during the Cold War, to enable its ships to fight off Soviet cruisers in the open ocean at ranges of 200 to 300 nautical miles/240-360 statute miles.[22] Twenty years after this original idea, the fear of such long-range naval engagements is barely remembered, least of all by naval professionals; but TASM's cousin, the TLAM, is one of the most widely-recognized weapon systems of all time.[23] The Tomahawk's best-known use has been its employment by President Clinton in attacks on Iraq from 1993 to 1998--strategic-level attacks which, in intent and objective, are as far from the original tactical purpose of a sea-launched cruise missile as it is possible to be.

Richard K. Betts described many missiles when he said of cruise missiles that they "evolved without a well-defined conception of why they are needed, and without an assessment of their full implications."[24] Betts chronicled comprehensively the generally unpremeditated development of the intimidation school of cruise missile philosophy, his seminal 1981 study *Cruise Missiles: Technology, Strategy, Politics* formulating the context of functional use in which long-range cruise missiles were viewed for the balance of the Cold War. There was no question that cruise missiles, in Betts's analysis, partook of the intimidating or coercive characteristics shared by ICBMs: even a simple survey of his chapter titles ("Strategic Retaliation against the Soviet Homeland," "Arms Control:

Negotiated Solutions," and "NATO Alliance Politics") leaves little doubt as to the trend

of thinking in the early 1980s on the roles and missions of cruise missile. His discussion

of the potential advantages of the cruise missile over other weapons is equally

informative. In specifically identifying the differences of the long-range cruise missile

and the ICBM, Betts emphasizes these differences not so much as operational[25]

advantages for the cruise missile in a conventional conflict but as potential roadblocks for

strategic arms control.[26]

Additional primary sources for missile history are Kenneth P. Werrell's *The*

Evolution of the Cruise Missile and Charles A. Sorrels's *U.S. Cruise Missile Programs:*

Development, Deployment, and Implications for Arms Control, both published during the

1980s at the height of the Cold War. These books trace the history of cruise missiles,

emphasizing the fledgling missile programs of Nazi Germany, which are often invoked as

a source of insight into the original impetus for developing long-range missiles.

Germany's schizophrenic approach to missile development--which yielded both the

ballistic (V-2) and cruise (V-1) missile during the Second World War--was only unified

somewhat ghoulishly in the Nazi propaganda machine's designation of both of these

weapons as *Vergeltungswaffe*, or Vengeance weapons. In the sentiment they inspired in

both the German and the British press, they seemed to fulfill the dire prophecies of Giulio

Douhet, who asserted of attack from the air that it could only lead to "complete

breakdown of the social structure . . . to put an end to horror and suffering, the people

themselves, driven by the instinct of self-preservation, would rise up and demand an end

to the war."[27] The legacy of this public perception of missiles persisted throughout the

Cold War, when the word missile was often considered consonant with wanton destruction; moreover, the philosophical underpinnings of this perspective accord well with the view of LRMs as a tool of political intimidation more than a form of indirect fire used to support military maneuver.

The recorded intentions of the German scientists who labored at Peenemunde, however, were more in harmony with the original, unpropagandized designation of the "V" missile program--*Versuchmuster*, or experimental.[28] The spiritual implications of the missiles were, as they perhaps are today, proposed by pundits; the warriors and scientists were more interested in their applications for effective warfighting. Few analysts, however, have successfully formulated the functional, or objective-oriented, assumptions behind the applications envisioned for the V-missiles.

MAJ William C. Story Jr. attempts to address this issue in his excellent thesis on the evolution of ballistic and cruise missiles for the Air University's School of Advanced Airpower Studies, "Third World Traps and Pitfalls: Ballistic Missiles, Cruise Missiles, and Land-Based Airpower." The analytical focus of Major Story's thesis, published in 1995, is on the relevance of missile capabilities to the waging of war in Third World countries. He surveys not only the birth of missile use as an operational concept in the Third Reich (as distinct from missiles' origins as a technological phenomenon), but lessons learned from their employment in the Arab-Israeli conflicts, the Iran-Iraq War, and the wars in Afghanistan and the Falklands. (For the latter series of lessons learned he relies largely on Anthony H. Cordesman and Abraham R. Wagner's multivolume *The Lessons of Modern War*, published by Westview Press in 1990.) Story's thesis is one of

the best military analyses of missile employment--in both theory and practice--outside the parameters of Cold War theory.

Two other documents are indispensable to a survey of missiles in the 1990s: W. Seth Carus' studies for the Center for Strategic and International Studies' (CSIS) Washington Papers series: *Ballistic Missiles in the Third World: Threat and Response,* and *Cruise Missile Proliferation in the 1990s.* These studies compile a wealth of information into two handy volumes. They emphasize diplomatic response to missile threats, such as the Missile Technology Control Regime (MTCR), rather than highlighting the effects of missiles on military tactical preparations. They provide an authoritative background, however, and repeat the same litany of benefits ascribed to the long-range missile by both Cold War cruise missile proponents and analysts of indirect fire systems.

The GAO studies of airpower in DESERT STORM and cruise missile performance in 1991 and 1993 are the most comprehensive such efforts since the United States Strategic Bombing Survey of World War II, completed in 1947. As previously indicated, they provide large amounts of data and are generally straightforward about the limitations of their collection and analysis. Their methodology can be used to evaluate basic data from other strikes where it is available.

Background documentation on ATACMS is drawn from several sources, of which the most forthcoming is a 1996 paper for the School of Advanced Military Studies by USAF MAJ Leonard S. Moskal: "The Role of ATACMS in JFACC Planned Deep Operations." An Army War College paper by LTC Philip O. White, "Role of the Army

Tactical Missile System in Joint Warfare," reinforces the theme of most writing on ATACMS that the system is especially suited to deep strike targeting, and quite possibly would be better used against joint targets at the strategic level than in a limited role against targets primarily of tactical value to the ground force commander.

In the next tier of research, which involves organizing the basic missile information within a theoretical construct, two works of proponency establish the primary framework. These are General Jonathan Bailey's Occasional Paper, *The First World War and the Birth of the Modern Style of Warfare*, for the United Kingdom's Strategic and Combat Studies Institute; and George and Meredith Friedman's *The Future of War: Power, Technology, & American World Dominance in the 21st Century*. These books, both published in 1996, offer conclusions which seem, on superficial acquaintance, to be contradictory.

General Bailey offers an explanation for the development of long-range fires which provides an intriguingly comprehensive conceptual framework in which to evaluate the full spectrum of missile efforts in the twentieth century.[29] While his intention was not to address missiles per se, he enunciates a principle which he himself argues is applicable to all forms of deep attack. Bailey achieves his overarching perspective by altering the analysis of when a true RMA last occurred, identifying it not as contingent on the information revolution since the 1930s, but as having occurred in World War I. In his view, the RMA was simply this: "warfare became dominated by artillery and artillery by indirect fire."[30] Before World War I armies sought to achieve destruction and thus victory through maneuver. In World War I and after, they shifted to

26

achieving maneuver and thus victory through deep-fire destruction, meted out with a conscious attempt at precision throughout the space relevant to the enemy--including his command and control, materiel stockpiles, and civilian economy. Bailey reverses the modern conception of the revolution as a phenomenon of information methods, contending instead that "the need for ever greater accuracy, range and less collateral damage, for reasons of military expediency, became a characteristic of the technical [i.e., informational] advances which have *followed* this revolution to the present day" (emphasis mine).[31]

Bailey is very clear that the revolution was in the relationship of indirect fire and maneuver; the difference after the revolution is that maneuver is now not merely supported by indirect fire but is contingent on it. The fearful experience of immobile trench lines in World War I was produced by an outmoded reliance on direct fire, and only indirect fire could restore the potential for maneuver. Technological leaps in indirect fire, including satellite target surveillance, remote command and control, and digital weapon guidance, have been mere refinements to a more fundamental paradigm shift.

In this scheme, the Multiple Launcher Rocket System (MLRS), the bomber aircraft, the cruise missile, and the ICBM are forms of indirect fire which support maneuver--or were at least originally intended to do so. At the tactical level maneuver may simply be an infantry division's move forward toward an enemy's capital city; at the strategic level it may entail a nation's freedom to choose between options, such as intervening or not intervening in a Middle East war. The value of indirect fire is the key:

it brings together the age-old tactics of "penetration, shock and disintegration" in "a novel, three dimensional, *'modern'* concept which [is] truly revolutionary" (emphasis in original).[32]

Implicit in this analysis is the assumption that maneuver, in whatever context, remains vital to achieving the objectives sought with force of arms. Maneuver may now be contingent on the success of indirect fire, rather than merely being assisted by it; but without maneuver serious objectives cannot be reached. This assumption is the basis for T. R. Fehrenbach's assertion that "You may fly over a land forever; you may bomb it, atomize it, pulverize it and wipe it clean of life--but if you desire to defend it, protect it, and keep it for civilization, you must do this on the ground, the way the Roman legions did, by putting your young men into the mud."[33]

The argument of the Friedmans, on the other hand, challenges Bailey's assertion that the indirect fire RMA of World War I was driven by military necessity to facilitate maneuver. The Friedmans make a point of the effect of technology on trends in warfare, and propose that the distinctive advance of the twentieth century is war's reliance on counterintuitive science. Their central principle of military technology is that science routinely renders it "senile"-- that is, more expensive to protect from new threats than it is worth operationally--by improving man's understanding of his physical environment.[34] Although the Friedmans regard the modern cruise missile as an ascendant, nonsenile technology in its present incarnation, they can envision its demise in the promise of space-based weaponry, instantaneous communications, and hypersonic propulsion.

On reflection, however, the aspects of scientific inquiry which often make its conclusions counterintuitive--invisibility to the naked eye, indirect proof--are the same ones which underlie indirect fire. It is unlikely to be mere coincidence that the tools for indirect fire, including reliance on second-party surveillance and firing on a calculated solution rather than at a visible object, were developed at the same time scientific disciplines made the leap from theorizing about smaller-than-visible phenomena, to proving their existence and characteristics by indirect means.[35] On this point Bailey and the Friedmans converge; they also end up confirming each other's conclusions about the obsolescence of two-dimensional maneuver warfare, if by divergent paths.

Bailey's assessment that, in World War I, "the power of machine guns and rapid rifle fire in defence brought manoeuvre to a grinding halt, and there was insufficient artillery firepower to break the stalemate in the offence" predicates his classification of firepower and maneuver as "tectonic plates" which finally collided in the period from 1914-1916. Indirect fire, he argues, is the buffer which adjusted he relationship of the colliding plates. It was drawn not from a revolution in technology, which had already quietly taken place, but from a desperate operational necessity, posed by the "brutal shock" of the inordinately bloody and intractable direct-fire "battles of 1914," and the concomitant "invalidation of existing doctrine."[36]

The Friedmans focus on technology rather than operational warfighting concepts, but come to a remarkably similar conclusion about the future of the tank (currently the premier maneuver weapon system), which they regard as senile: "The ability to see is conceptually separate from the ability to shoot and practically different as well, since

29

vision should be located at the highest, clearest point, while the weapon should ideally be shrouded in ground clutter. As new technologies mature, it will make little sense to put these functions together in **one slow vehicle and then drive them within a few miles of the enemy**" (emphasis in original).[37]

Their assessment of the weaknesses of the tank, and of the indirect fire technology which obviates its strengths, echoes Bailey's evaluation of the conceptual weakness of direct-fire and linear-maneuver warfare, when confronted with the effectiveness of modern firepower, with remarkable consistency. (The Friedmans' appreciation of indirect fire translates into a similar theory that, in the cruise missile age, the aircraft carrier is as threatened as the tank by its need--conceptually identical if different in terms of absolute rang--to "drive within a few miles of the enemy.") Such a need felled the war plans of 1914, along with the warring armies, and remains the salient problem for the mechanisms of war in the 1990s.

Bailey's theory categorizes the missile neatly as an indirect fire system; the Friedmans present a scientific case for the extrapolative follow-on: that indirect fire may serve as a substitute for maneuver, rather than merely facilitating it. In conjunction with Cold War missile theory, which argues that indirect fire in the form of missiles can supplant maneuver from an operational (that is, functional) perspective, in terms of the best means to attain objectives, the Bailey and Friedman approaches form two-thirds of the theoretical context in which to evaluate LRMs. Neither supposition is itself a given in this thesis--rather, the three interlocking theories provide the framework for useful analysis.

The final third of the theoretical framework, which underlies the assessment of

LRMs as a form of strategic interdiction, is the approach in this thesis to airpower as a

method of coercion or intimidation.[38] Proponents of airpower have challenged the

assumption that ground maneuver is indispensable since the first biplanes took to the sky.

Briefly, their argument declares that objectives, including the victory of compelling an

enemy to give up his purpose, can be achieved without conventional maneuver.

Satisfactory examples of this achievement have been difficult to produce from the history

of aerial bombardment up to the 1980s, as even airpower proponents agree. However,

Mark J. Conversino, in a 1998 *Parameters* article entitled "The Changed Nature of

Strategic Air Attack," provides a compelling summary of pertinent examples which bear

on the analytical approach of this thesis.

Since 1981, Israel's bombing of the Iraqi nuclear plant at Osirak, the U.S.

bombing of Libyan targets in Tripoli, and NATO Operation DELIBERATE FORCE, the

air campaign against the Bosnian Serbs, have served as cases in point for their argument.

Many airpower enthusiasts would, in fact, contend that the true RMA of the twentieth

century is even more profound than the one advanced by General Bailey; consisting in an

unprecedented option to achieve success through force of arms without setting armies to

maneuver against each other.[39] Thus, by extrapolation from the experience of airpower--

at least as analyzed by its apologists--LRMs imply a ability to achieve goals without the

inconvenience of a ground campaign.

That such a possibility has occurred to national and military decisionmakers, as

well as theorists and political pundits, seems evident in the series of missile strikes

undertaken by the United States in the 1990s. In two cases, President Clinton used missiles in conjunction with tactical bombing by aircraft (in DELIBERATE FORCE and the strikes of December 1998 on Iraq, Operation DESERT FOX). However, four of the six separate strikes between January 1993 and December 1998 were conducted with missiles only (TLAM and CALCM). No ground maneuvers followed the missile and air strikes: the strikes were not intended to create exploitable conditions for an army, but instead to have an effect by themselves. These strikes in particular, therefore, validate the evaluation of LRMs as tools for compelling the enemy without maneuver.

Beyond summarizing the airpower victories listed here, Conversino's unique contribution is to synthesize elements of airpower philosophy to arrive at a concept of air attack as a method for both direct accomplishment of campaign goals, and indirect accomplishment through the facilitation of successful maneuver. He argues that the traditional concept of "strategic attack,"[40] which focused on civilian infrastructure, industry, and other targets which may affect an enemy only over the long run, was never entirely accurate and is now increasingly outdated. On the contrary, in fact, some of the most effective examples of recent airpower application--such as the DESERT STORM attack on Iraqi command and control--are instances of air attack against militarily significant targets. Even the famous Israeli attack on the Osirak plant in Iraq, while it equated to an attack on an infrastructure capability, had direct and immediate relevance for the national security of Israel, and was in no way oblique or attritional: its effect was unquestionably prompt and decisive.

32

Conversino's argument may posit more of an adherence to the old (Douhetan) perception of airpower than there really still is in the average mind, but it does missile analysts the service of proposing that long-range air attack fills multiple roles, and that many of them fit well the paradigm of indirect fire support constructed by General Bailey. Conversino's essay is a counterpoint to Robert A. Pape's *Bombing to Win*, a study, published in 1996, of the success of aerial bombardment in coercing enemy populations to capitulate. Pape approaches air attack through the extreme theoretical construct of Douhet, the father of modern airpower, whose best-known predictions involved enemy peoples succumbing to an attacker under the relentless assault of national bombardment.[41] Pape's conclusion is that this form of intimidation does not work, based on the intransigence of the British, Germans, Japanese and others in the face of ceaseless air attacks on their homelands.

The principal interest of Pape's study is the reminder it provides of the historical framework for airpower theory, and its relationship to long-range missile theory in the Cold War. Theories about the use of LRMs in the post-Cold War period should be clearly distinguished from theories about their use during the Cold War, if the theories are different; and the Conversino piece succeeds in establishing credibly, through the contrast of its view of airpower with Pape's, that they are. This step is of particular utility in evaluating the national objectives of the Clinton-era missile strikes in Chapter 7; although they are strategic strikes in the sense of objectives, that qualification does not necessarily carry over to their destructive purpose, or the theory behind employing them.

Much professional writing supplements the opinion of doctrine on the interrelationships of airpower, maneuver, and deep battle; less has been devoted to the study of missiles in these contexts. The following titles, while not constituting an exhaustive list, have made significant contributions to the construction of this thesis' line of inquiry:

1. *Field Artillery* magazine's March-April 1993 issue, devoted to deep battle, and including the following articles: "Shaping the Battlefield—Deep Operations in V Corps," and interview by LTC Jerry C. Hill and LTG Jerry R. Rutherford, then CG V Corps; "Fighting Maneuver and Fires in the Third Dimension," by MG J. David Robinson and COL Charles M. Burke; and "Deep Interdiction—The MLRS Deep Strike Option," by COL Dennis C. Cline and LTC Joe G. Taylor, Jr.

2. "Deep Battle and Interdiction," an article by MAJ Kevin A. Woods (USA) in *Field Artillery*, January-February 1998.

3. "Army Doctrine and Modern War: Notes Toward a New Edition of FM 100-5," by Frederick Kagan, in *Parameters*, Spring 1997.

4. "Myths of the Gulf War: Some Lesson not to Learn," by Dr. Grant T. Hammond, in *Airpower Journal*, Fall 1998.

5. "Battlespace Dominance in the First Days of the Next War: Cruise Missiles or Bombers," a monograph written for the School of Advanced Military Studies at Leavenworth by MAJ Charles E. Forshee (1997).

6. "A New Paradigm for Combat Operations," a Doctrine Note by LTC Jeff Duncan and MAJ Charles Hansrote posted on the Library web page of the Combined Arms Doctrine Directorate.

7. "The Origins of the Deep Attack Weapons Mix Study," Dr. Rebecca Grant, ed., a 1997 analysis of the 1995 DAWMS performed by the independent Commission on Roles and Missions of the Armed Forces. Posted on the web page of IRIS Independent Research.

The principles of war, which play a vital role in the analytical model of this study, are derived from U.S. Joint Chiefs of Staff Joint Publication 3-0 (1995). The nine joint principles of war--*objective, offensive, mass, economy of force, maneuver, unity of command, security, surprise*, and *simplicity*[42]--are relevant to the task at hand: evaluating LRMs as a means of compelling an enemy. However, significant contributions are also to be found in professional writings which propose revisions to the principles of war in the post-Cold War environment. One such document is an Army War College monograph entitled *Principles of War in the 21st Century: Strategic Considerations,* published in 1995. The War College monograph offers a useful discussion of the effects of the information age on the principles of war, and proposes modifications to them that, in some cases, are particularly relevant to the question of this thesis (e.g., the monograph's argument for restating the principle of mass as "focus"). Russell W. Glenn's article in the Spring 1998 issue of *Parameters*, "No More Principles of War?" also presents an interesting approach to codifying military operations. Glenn transitions conceptually from "principles of not only war" (accounting for operations other than war)

to "principles of operations," which he contends have more universal applicability to the full spectrum of military activities. His most noteworthy principle of operation is "exploitation"--a requirement which can be interpreted in one sense as calling for synchronized, seamless employment of indirect fire; and which has not previously been captured satisfactorily in the traditional principles of war.

Beyond the theories of specific aspects of warfare summarized above (indirect fire, intimidation through airpower, and principles of war), three volumes of predictive analysis about war in general have been influential in creating the conceptual environment for this thesis. They are Martin van Creveld's 1991 *The Transformation of War*, whose chapters "How War is Fought" and "What War is Fought For" contain the seeds of a viable post-industrial theory of why one nation might launch LRMs at another. Alvin and Heidi Toffler's book *War and Anti-War*, while its argument goes even further than this thesis (i.e., in suggesting that national objectives can be achieved through the application of force that does not involve blowing anything up), has nevertheless assembled a useful compendium of Information Age theory. The popular judgment of the Information Age on a variety of relevant topics can be reliably extracted from *War and Anti-War*, and it will be used for that purpose here. Finally, Steven Metz and James Kievit's Army War College monograph, *Strategy and the Revolution in Military Affairs: From Theory to Policy* is a valuable summary of mainstream thinking on the technological RMA and its implications for future military arrangements. While General Bailey's argument for an earlier, operationally oriented RMA resonates powerfully when juxtaposed with this study's question about LRMs, the formulation of a technological

36

RMA has achieved such widespread acceptance that it would be imprudent to fail to address it here--by contrast at least.

The most specialized category of military professional analysis relevant to this thesis is the study of missiles' operational performance per se; and in this category, two studies by military college students comprise the extant attempts to methodically evaluate missiles that fit the definition of this thesis in the context of modern war. Both focus on cruise missiles. The first, LTC John T. Bowen's *The Poor Man's Air Force: Implications of the Evolving Cruise Missile Threat*, was written for the Army War College in 1997. Bowen's paper argues that cruise missiles will become a weapon of choice for poorer countries because they are cheaper and less technologically complex than ballistic missiles and can be readily engineered from the technology of aircraft and remotely piloted vehicles already in the inventories of these countries. The cost benefits, combined with the draw of superior accuracy and lack of defense systems optimized for cruise missiles, will make such missiles a principal threat to U.S. forces deploying for contingencies in the next decade. Bowen concludes that America must vigorously pursue the development of cruise missile defenses to prepare for this threat.

The second study, by Timothy F. Sparks, is a thesis written for the Naval Postgraduate School in 1997, entitled "The Dawn of Cruise Missile Diplomacy." The thesis contains useful summaries of the cruise missile strikes on Iraq in 1993 and 1996, and a review of missile use in DELIBERATE FORCE in 1995. Sparks's study performs the service of providing ready-made research on these events. Its approach to documentation is quite thorough; however, its analytical approach lacks a key element.

37

Sparks concludes that cruise missiles have (again) become the weapon of choice, and that the U.S. ought to buy more of them and build even better ones--but he bases this conclusion not on an assessment of their operational effectiveness, but simply on the fact that they have been used (with a review of the cruise missile benefits frequently cited, such as precision and reduced risk for own-force personnel).

He can hardly be faulted for doing so, when this absence of rigor is found in virtually every analysis, professional or popular, on the utility of the cruise missile. What a threat cruise missiles--or long-range missiles in general--are going to be is a common theme, and by definition an unprovable one. Likewise, the argument for LRMs like the TLAM often boils down to--The president uses them. Regrettably, the counter-arguments advanced by those who disapprove of the political celebrity of long-range missile strikes often fail to rise above the level of "Ha! Cruise missiles aren't so hot."[43]

As mentioned above, this approach, which lacks method and a specific enunciation of premises, is the most serious deficiency encountered in the primary literature research for the present thesis. Chapter 3 will detail the methodology envisioned to address it, in the analysis of the missile employments selected for this study.

CHAPTER 3

RESEARCH METHODOLOGY

Evaluating the impact of long-range missiles on the equations of combat is a process primarily involving an analysis of data already assembled in previous studies, coupled with an assessment of how applicable conclusions from that data are to other events. The basic questions of the thesis, as formulated in chapter 1, are:

1. Does the use of long-range missiles measurably improve their users' chances of compelling an enemy to give up his purpose while minimizing harm to themselves?

2. If so, how is this improvement realized? Do the missiles exert a particular, missile-unique, compelling force in and of themselves, or do they improve the mechanism of military compulsion as one among several contributing factors? In terms of the framework developed in chapter 2, do LRMs achieve compulsion of an enemy directly, as a means of intimidation? Or do they compel the enemy indirectly, through facilitating the maneuver which puts the enemy at a disadvantage, and thereby compels him to give up his purpose?

3. Is the contribution of LRMs uniform across the historical record of conflict, and at all levels of war?

4. Can LRMs supplant higher-risk forms of engagement (such as maneuver of ground forces) as a tool of war, while achieving the same or better effect?

The analytical method of this thesis is to approach these questions in terms of the use of LRMs in a specific series of real-world military campaigns and strategic-level strikes, and of the results achieved by LRMs in those cases. Research methodology is

39

characterized by two essential delimitations. First, primary research data gathering is not used. Second, U.S. government official statements and defense industry reporting are used for baseline assertions about missile effectiveness for the post-DESERT STORM strikes, on which comprehensive assessments have not been published by government agencies.

As indicated in chapter 1, the events to be evaluated are the following:

1. Use of MLRS/ATACMS in DESERT STORM (tactical-level use of long-range missiles).

2. Use of TLAM in DESERT STORM (operational-level use of long-range missiles).

3. Use of TLAM in DELIBERATE FORCE (operational-level use of long-range missiles in an air-only campaign).

4. Use of TLAM and CALCM in the missile strikes of 1993, 1996, and 1998 (strategic-level use of long-range missiles).

The investigation develops from the tactical-level, analyzed missile events through operational-level events, and culminates in evaluation of the strategic-level events, for which an analysis of this kind has not yet been performed. Proceeding in this manner accumulates principles and lessons learned, and at each succeeding step verifies whether they may be validly applied to the new level of warfare under consideration. For example, if the organically tasked long-range precision offered by ATACMS enables a ground commander to maneuver more boldly because he can shape his deep battle more effectively, this lesson may apply to use of TLAM at the operational level of war.

To achieve this cross-level comparison, each of the events reviewed in the study is approached through the following assessment factors.

First, the effectiveness of LRMs in achieving the goals of the battle (tactical level) or campaign (operational or strategic level) is examined. One factor in this effectiveness is the weapons' success in delivering their intended effects. However, it is only essential for our purposes to know whether the weapons were successful; technical reasons for success or lack of it are outside the scope of this inquiry. The command and control coordination required to execute an LRM strike may, however, be of interest. To the extent that it is either a facilitator or an inhibitor of *unity of command*, it is a unique property of LRM employment which directly affects a principle of war.

With the weapons' technical effectiveness established, the contribution of the missile strikes to the commander's objectives is examined in each situation. An example illustrates this approach at each level of war. At the tactical level, the focus is what ATACMS achieved for the Land Component Commander in the ground war of DESERT STORM. At the operational level, what missiles achieved for the DELIBERATE FORCE commander is examined. Finally, the strategic level is analyzed through a review of what was accomplished by the missiles employed in the 1990s strikes.

Considerable theory has been advanced on the role of missiles in DESERT STORM and even in the DELIBERATE FORCE strikes. It was not the objective of this thesis to develop fundamentally new ideas about the use of missiles in such theater-level campaign settings. Rather, existing evaluations--drawn from the literature summarized in chapter 2--were collated.

41

The role of missiles in campaigns has been studied in two primary avenues of analysis: the role of missiles per se, and the role of airpower, with missiles considered one of its subsets. This thesis focused on the analyses of missile employment, because of the vital distinction its concern is with unmanned missiles launched from outside the enemy's circle of comparable lethality. However, observations about the contributions of airpower were included where they were applicable.

Accumulated observations on missile use in the operational-level campaigns support the final and most original analysis of the thesis: evaluation of the operational effectiveness of the missile strikes on Iraq, Afghanistan, and Sudan in achieving strategic objectives. At each level of war--the tactical, operational, and strategic events--the specific objectives for the military action were reviewed. The criteria for determining the operational effectiveness of missile strikes in meeting the objectives of the strategic military actions mirror those used for the tactical and operational events, as far as possible. The criteria included (but were not limited to):

1. Whether the missile strikes created an advantageous situation which could be exploited (analogous, for example, to the exploitation of an enemy air defense system rendered useless by TLAM strikes). This criterion relates to the formulation of LRM use as an enabler of maneuver.

2. Whether the missile strikes resulted in advantage overall for objectives (i.e., did the strikes render them easier to achieve). This criterion addressed the possibility that advantage may be obtained without maneuver, and sought to identify when or if this has occurred in LRM employment.

3. Whether achieving or recognizing the exploitable effects of LRM use took place within a time period which enabled the analyst to call them decisive. This criterion recognizes that the use of firepower to create exploitable conditions may or may not have a decisive effect, depending on whether the conditions were either created or recognized in a timely manner. Of significance to this criterion is the question of whether the exploitable effects created with LRMs are in fact of value to the declared objectives of a campaign, or whether they are peripheral or irrelevant to them.

4. Whether any effects or advantages produced by the missile strikes were actually followed up with strategic-level prosecution of a "campaign," whether using diplomatic, economic, informational, or military means. This criterion recognizes, in its turn, that conventional ground maneuver may not be the only method of exploiting an advantageous condition generated by LRM use. It is used to identify the use of other methods, primarily at the strategic level of war.

The review of missile contributions to the achievement of objectives was accompanied, for each event, by a summary of the intentions stated by the decisionmakers (or assumed of them by analysts) with respect to their choice to use LRMs. One delimitation must be noted. The desire to test a missile in real-world circumstances was eliminated as a factor in the analysis here. It may have been present in some of the events analyzed, but it had no relevance for the thesis question. Rather, intentions such as reducing personnel risk by striking targets with unmanned missiles, or limiting collateral damage by using precision-guided weapons, were the ones of interest. These intentions were compared with the results, a procedure which the GAO studies

43

completed for DESERT STORM, and for which considerable professional literature offered reliable analysis in the case of DELIBERATE FORCE. Again, this particular comparison for the 1990s missile strikes required some analysis by analogy and extrapolation. This is an area in which opinion is more common than factual analysis, and some conclusions may therefore be tentative.

Having established a baseline of the LRMs' operational effectiveness and conformance to expectations, the thesis offered at least a partial doctrinal evaluation of their impact on warmaking through the nine principles of war. This discussion relied on both the existing joint definitions of principles of war, and on recent attempts to revise them in light of the revolutions in automation and information technology. It should be reiterated, however, that this process of filtering missile events through the principles of war was not merely a peripheral exercise, but is the vehicle for a more fundamental analysis. If the principles of war are, as Joint Pub 3-0 asserts, "the enduring bedrock of US military doctrine,"[44] then what was revealed about LRMs through these principles, and what LRMs in turn revealed about them, were potentially of considerable significance for warfighting as a whole.

This last step in the analysis provided the focus for synthesizing the thesis's overall conclusions. The impact of any weapon's operational effectiveness can be most usefully evaluated in the context of how it enhances application of the principles of war, how it violates them, or how it reveals that they are inadequate as currently defined. To date, this has been somewhat unconsciously done with respect to LRMs, in the sense that they have been tacitly evaluated, because they reduce risk to own forces, in terms of their

44

enhancement of *security*. In this thesis, however, in keeping with the overall analysis, LRMs were deliberately analyzed from the standpoint of how effective their use has been for compulsion, and whether that effectiveness necessitates the fundamental change in doctrine that would be implied by rethinking any of the principles of war.

CHAPTER 4

ANALYSIS--TACTICAL LEVEL OF WAR

The Army Tactical Missile System (ATACMS) was used for the first time during Operation DESERT STORM in January and February 1991. ATACMS had been developed, like other long-range missiles, for a specific purpose it did not necessarily serve in the Gulf. ATACMS was originally developed, somewhat tangentially, from the Defense Advanced Research Projects Agency's (DARPA's) Assault Breaker Program. Like other weapons programs of the early 1980s, the Assault Breaker Program focused on the NATO problem of fighting the Soviets in Europe; and in particular, slowing the waves of attacking Warsaw Pact armor expected in that potential conflict. Assault Breaker gave rise to both ATACMS and the Joint Surveillance Target Attack Radar System (JSTARS), which, used in concert, were expected to achieve a certain level of interdiction against advancing enemy armor without placing pilots and aircraft in unnecessary danger. It was assumed by military planners that aircraft would continue the inherently risky function of air interdiction, but that ATACMS, supported with targeting information by JSTARS, would free up Air Force assets for deeper (longer-range) interdiction missions.[45] The Assault Breaker Program and its most prominent offspring thus fit comfortably into the indirect fire/maneuver paradigm of General Bailey, both JSTARS and ATACMS employing modern technology, but performing the maneuver-enabling function that revolutionized World War I.

The first ATACMS were being prepared for deployment to Europe in mid-1990 when Iraq invaded Kuwait. Two ATACMS-equipped Multiple Launch Rocket System

(MLRS) battalions were deployed to Saudi Arabia in late 1990, and ATACMS saw its first use on 28 January 1991. ATACMS was used initially during the thirty-nine-day air campaign to strike air defense targets, well before the ground assault began in late February. A total of thirty-two ATACMS were eventually fired, used primarily on air defense targets (radars, artillery, missile launchers, and command buildings), although on one occasion ATACMS struck a bridge crossing and destroyed more than 200 unarmored Iraqi vehicles attempting to cross it. Standard MLRS rounds were the ones used to attack Iraqi artillery (i.e., other than antiair); ATACMS was considered too precious an asset to be expended on the numerous enemy battlefield artillery targets.[46]

ATACMS was assessed to have been a technical success in DESERT STORM, satisfying ground commanders in everything but its range. U.S. Central Command's Army component requested available ATACMS for use in DESERT STORM once its performance had been proven. The Title V Report to Congress on the Gulf War does not specify a success rate for ATACMS, but indicates that it was not assessed to have any technical shortcomings.[47]

It is worth noting that the targets struck with ATACMS were not attacked with other weapon systems, meaning that damage to those targets could confidently be attributed to ATACMS itself. This same confidence in the specific effects of ATACMS was increased because ATACMS could often be employed in a shorter and more integrated targeting cycle (that is, detection through attack and damage assessment) than Air Force and Navy weapons. Whereas Air Force and Navy assets might strike a target last located the previous day, with the damage assessment on that target following over a

47

period of hours or days, ATACMS was generally used--often in response to a short-notice request directly to the artillery commander--against air defense targets that proved within minutes whether they had been put out of action, by terminating radar emissions or failing to launch ordnance. These factors eliminated much of the ambiguity which plagued postwar attempts to assess the performance of, for example, the TLAM.

Even given its technical success, the small number of ATACMS used might have made it difficult to gauge ATACMS' operational impact, were it not for the fact that most ATACMS rounds were employed against air defense targets. In late January and mid-February, when ATACMS was used for suppression of enemy air defense (SEAD), its effectiveness was evident in the fact that "coalition aircraft flying through flight corridors cleared by ATACMS strikes reported no enemy air defense radar activity."[48] During the ground war, close air support pilots specifically requested SEAD support from ATACMS due to its success in the air campaign. One facet of ATACMS' impact on operations, then, was its ability to facilitate air interdiction and air support through effective SEAD.

The other facet of this impact was ATACMS' responsiveness. It could be requested for SEAD on short notice, from the corps artillery commander, as long as it was on the corps commander's side of the fire support coordination line (FSCL)[49]--in contrast to airborne support from the Air Force or Navy, which required considerably more lead-time and coordination through the Joint Force Air Component Commander's (JFACC's) Air Operations Center (AOC). A-10 pilots found the responsiveness of ATACMS particularly gratifying; but this attribute was, in fact, a function of command and control relationships which became a source of inter-service (Air Force-Army)

48

conflict during and after the war, precisely because of the deep strike potential ATACMS turned out to have.

The postwar tension between the Air Force and the Army over command and control (C2) of ATACMS sheds a useful light on thinking about the missile. Within ten years, ATACMS had gone from assault breaker to SEAD weapon, and soon was even being proposed as a SCUD-killer.[50] Breaking an armored assault fits neatly into the purview of the ground commander, being an effort that should, in virtually any situation, be undertaken on his timetable and at his command. SEAD for the ground commander's close battle has also normally been conceded to him by the air component commander; but SEAD for interdiction--which is routinely equated by military writers to "deep strike"[51]--has been the province of the Air Force since World War II. Likewise, the enormous, integrated targeting effort associated with detecting and attacking SCUD missile launchers has usually been assumed to be feasible only for an organization like the JFACC, which can coordinate not only all-source intelligence and surveillance aircraft, but alert and divert bomber missions, to bring the maximum firepower to bear on mobile enemy hardware.

In the Air Force's view, the pre-DESERT STORM assumptions about SEAD for deep strike missions, and the commonly accepted interpretation about the lessons of the Gulf for SCUD-killing, remain valid. The Army, based on the demonstrated properties of its long-range missile, proposes alternative assumptions. The Air Force-Army dispute is not the subject of this thesis--but the elements of that dispute are, in fact, informative for the evaluation of ATACMS. The tactical use of ATACMS in DESERT STORM would

49

hardly have raised an Air Force eyebrow if the missile had been merely a form of traditional indirect fire, like the hundreds of standard MLRS rounds used on Iraqi artillery, intended to facilitate the activities of ground maneuver forces. It was the employment of ATACMS against "Air Force targets"--which were the preponderance of ATACMS targets--that produced a C2 disjunction. The targets struck by ATACMS--air defense site elements--are generally categorized as interdiction or SEAD targets, and contribute directly to the achievement of air superiority. They contribute only indirectly to facilitating ground maneuver: their contribution being more immediate when close air support is in question, and much less so when the SEAD or interdiction supports strategic strike deep in the enemy's rear.

Does this mean that ATACMS use in the Gulf strayed from true dedication to indirect fire for the purpose of supporting maneuver? By a narrow definition of maneuver this might be the conclusion. However, to the extent that air forces require indirect suppression of an enemy's direct fires aimed at them, in order that they themselves might move freely to place the enemy at a disadvantage, a better answer is probably that ATACMS was actually used as a form of indirect fire to facilitate tactical air force maneuver.[52] This conclusion suggests that ATACMS remained a comparatively traditional indirect fire weapon in DESERT STORM. If its facilitation of ground force maneuver was, for the most part, a secondary effect, ATACMS use was nevertheless firmly rooted in the support of tactical maneuver objectives.

That Army postwar proposals for ATACMS made the leap from maneuver support to SCUD hunting is indicative of the pull of technological possibilities, as well as

the enduring power of the Douhetan idea of the terror weapon. SCUD hunting qualifies far less than SEAD as a form of maneuver support. It is, as Lieutenant Colonel White points out in his 1993 paper, an element of theater missile defense (i.e., Attack Operations),[53] but theater missile defense (TMD) supports maneuver only indirectly, at best. In the case of DESERT STORM, the SCUD posed little threat to tactical maneuver; a measurable but not highly significant threat to friendly rear operations; and its greatest threat to the cohesion of the U.S.-led Gulf War Coalition.[54] It was certainly desirable, from the political Coalition perspective, to render Iraqi SCUDs as ineffective as possible--but this necessity was clearly strategic, and just as clearly linked with psychological effects and popular will.[55]

This Douhetan understanding of the SCUD problem as a source of fear and dissension within the Coalition was undoubtedly accurate. It is a testimony to the persistence of Douhetan psychology--in spite of seventy years of energetic attempts to disprove its influence[56]--that three senior services (Army, Navy, and Air Force) have expended considerable effort since DESERT STORM to improve their respective capacities for SCUD hunting. Nor is it likely to be coincidence that the major research and development (R&D) thrust of each service's effort has been a missile system.[57] Besides the operational advantages associated with a missile--potential for precision targeting, stand-off delivery, reduction of risk to own forces--it is easy to identify the philosophical legacy of the Cold War at work, in which missiles defend against missiles, often by attacking them before launch.

Using ATACMS or any other missile system to foil an enemy's attempts to inflict

terror on populations is a strategic activity. In one sense, such attacks might be

considered a form of intimidation, to the extent that they may so degrade an opponent's

ability to conduct strikes of his own that he is coerced into giving up his purpose on that

basis. This was certainly a Cold War formulation, and the fundamental reason for

maintaining a first-strike capability with nuclear ballistic missiles.[58] However, in the Gulf

War the Coalition's efforts to find and destroy Saddam Hussein's SCUD launchers hardly

had this end in view. It is neither inaccurate nor disingenuous to assert that SCUD

hunting was, for the Gulf War Coalition, a purely defensive effort. From this perspective,

SCUD hunting undertaken with long-range missiles appears to be a form of LRM

employment that fits neatly into neither indirect fire nor intimidation.

It is worth reiterating that the actual, demonstrated effectiveness of ATACMS in

DESERT STORM was in facilitating air operations through SEAD. Supposing that

alternative forms of SEAD--such as airborne jamming, and escorts equipped with high-

speed anti-radiation missiles (HARM)--entailed greater risk to Coalition forces, the use of

ATACMS produced the benefit of maintaining total force effectiveness with reduced risk.

Thus, employment of ATACMS enhanced application of the principle of *security*,

improving the joint force commander's (JFC's) ability to manage risk to his forces.

As discussed above, ATACMS also facilitated *maneuver*, both directly for air

forces, and indirectly for the ground forces supported by the air forces' resulting ability to

place the enemy at a tactical disadvantage. ATACMS also served to apply *economy of*

force, to the extent that it represented an allocation of minimum essential combat power

52

(a single missile battery, requiring relatively little organic protection, rather than the planning and resource commitment of a multiship airborne SEAD mission) to achieve the necessary effect in a supporting effort (that is, air support to ground operations). The reduced complexity--in time, coordination, and participation--associated with employing ATACMS against air defense targets, as compared with the effort required to attack the same targets by the JFACC, also enhanced the *simplicity* of the operation as a whole.

In several ways, therefore, ATACMS proved advantageous for application of the joint principles of war identified as crucial for military success. Its employment contributed indirectly to attainment of the overall DESERT STORM objectives (compelling Iraqi forces to withdraw from Kuwait, protecting Saudi Arabia, and destroying Iraq's ability to project military power),[59] but significantly, achieved this with a simplicity and economy that eliminated distractions from the execution of supporting fires. Because using ATACMS on a target required less secondary preparation, coordination, and risk management than its alternatives, as well as fewer high-maintenance resources (e.g., pilots and advanced aircraft), ATACMS could even be said to enhance the principle of *objective*, which demands the avoidance "of actions that do not contribute directly to achieving the objective."[60]

By achieving this performance without detracting from *mass, offensive*, or *surprise*, ATACMS proved its ability to enhance the application of joint principles of war. As already noted, it proved this in terms of tactical operations: the objectives it was effective against were tactical (suppressing enemy air defense to enable air forces to perform their missions), and they contributed to the progress of the operational campaign.

Moreover, ATACMS' effects may be placed in the category of indirect fire, in the traditional sense, invoked by General Bailey, of facilitating tactical maneuver.

ATACMS' record in the Gulf War thus suggests three lessons relevant to this thesis. First, its proven effectiveness in operations was a matter of indirect fire in facilitation of maneuver. By contrast, ATACMS employment cannot be logically categorized as a form of intimidation or coercion in DESERT STORM; it was not intended to compel the enemy, in and of itself, to give up his purpose, and it did not.

To the extent, however, that use of ATACMS enhanced the effectiveness of maneuver forces--both air and ground--in placing the Iraqi Army at a disadvantage, and thus compelling Iraq to give up her purpose, ATACMS can be said to have increased the probability that Iraqi would be so compelled. As its use generally enabled the joint force and land component commanders to more effectively apply the principles of war, especially in *security* for own forces and *simplicity*, ATACMS both promoted the implementation of those principles, and implied their continuing validity in modern warfare. This is ATACMS' second lesson from the Gulf.

Where ATACMS presented a challenge for the existing principles of war was in the principle of *unity of command*. Given C2 arrangements in DESERT STORM, optimizing the strength of ATACMS--responsiveness and simplicity of coordination-- meant reducing, at least in part, the unifying command authority of the JFACC to direct the attacking of all targets beyond the ground commander's FSCL. This challenge to unity of command arose from a more fundamental change implied precisely by the range

of long-range missiles. That change is the ground commander's geographically expanding perception of what affects his battlespace, and what he can do about it.

The record of ATACMS indicates that the enemy's air defenses are something the ground commander can influence with ATACMS; and these air defenses have direct tactical--as well as implied operational--effects on the ground commander's campaign. The trend of speculation about ATACMS since the Gulf War indicates, however, that for whatever reason, possession of a long-range missile has prompted Army thinkers to propose using it against targets--like SCUD missile launchers--whose loss would achieve strategic benefits for friendly alliances, by preventing the enemy from using this form of strategic attack.

This fact suggests a third lesson from ATACMS use in DESERT STORM. That lesson may be summarized as follows: LRMs tend, regardless of their demonstrated effects, to encourage their possessors to predict strategic uses for them. In the case of ATACMS, the strategic use envisioned is attack against enemy missile systems; and it may be of significance that this is so. As already indicated, such attacks, if categorized by their effects, are different from either indirect fire as a facilitator of maneuver, or the use of missiles to intimidate and compel an enemy without maneuver. They are, instead, a defensive measure, intended to prevent an enemy from bringing a primarily strategic counterforce to bear. It may be that missile defense is a unique requirement of the missile age that, without obviating or invalidating the tactically oriented employment of indirect fire, or even the strategic philosophy of compelling the enemy through missile attack, nevertheless creates a third category of long-range fire effects. Examination of the

55

accumulated record of other LRMs since DESERT STORM may shed light on whether

this is so, and what its implications may be.

CHAPTER 5

ANALYSIS--OPERATIONAL LEVEL OF WAR

The Tomahawk Land Attack Missile (TLAM) had been deployed in the fleet for

less than five years when it was first fired in anger in DESERT STORM (January 1991).

Like ATACMS, it was a comparatively new weapon; nothing like it had seen service

during the Vietnam War, and its provenance was in the requirements of operational

planning for the conflict with the Warsaw Pact expected by the West throughout the Cold

War. As indicated in chapter 1, the original need for a ship-launched, long-range cruise

missile was identified in the late 1960s, as a counter to the threat of Soviet ship-launched

cruise missiles (SLCMs) which eventually threatened U.S. warships from stand-off

ranges of up to 300 kilometers/180 statute miles.[61]

As chronicled by Kenneth P. Werrell, technological feasibility and the tendency

of missiles to be assigned strategic uses combined to produce a detour in the development

of naval cruise missiles, through strategic nuclear deterrence. The TLAM-N (or nuclear

warhead variant of the Tomahawk) was birthed from a submarine community program to

equip attack submarines with long-range antiship missiles, through the midwifery of

Admiral Hyman G. Rickover.[62] TLAM-N, although its technological parentage was

grounded firmly in antiship design, offered the Navy a counterpart to the long-range land

attack cruise missiles in development by the Air Force in the early 1970s, and thus won

the race for funding ahead of its conceptual antiship predecessor--which eventually

became the Tomahawk Antiship Missile (TASM).

TLAM-N became a bargaining tool in Cold War negotiations on arms control because of its ability to hit targets deep inside the Soviet Union. In fact, military and professional theory about cruise missile use was essentially centered on the idea that cruise missiles enabled their employers to achieve strategic effects, such as neutralizing an opponent's response mechanisms, in a new and unanswerable way.[63] Although Richard Betts had some difficulty envisioning uses for it in the early 1980s,[64] national military planners did not. The TLAM-N was effective over a considerably longer range than the TASM--1600 kilometers/1000 statute miles, versus the TASM's 500 kilometers/300 statute miles--and was envisioned to be used for strategic purposes in an all-out war: specifically, the utter destruction of Soviet command and control facilities for the air and maritime defense of its Northwestern and Far Eastern perimeters.[65] The consequent blinding of Soviet forces to the most sensitive axes of Allied attack was expected to ensure that the Soviet Union was reeling on the defensive, on every flank, as it pursued its expected initiative against NATO in central Europe.

The TLAM-C (or conventional warhead variant of the TLAM) was considered a lesser member of the Tomahawk family during the Cold War. Its conventional warhead would produce less devastating damage, and send less of a signal of national determination, than the nuclear variant in a land attack; and it was thus regarded as primarily an adjunct to conventional airpower in operational-level targeting. In the early 1980s, when professional argument over the employment of naval cruise missiles was at its height, the TLAM-C was seen as being suitable for attacking airfields and little else.[66] TLAM-N and TASM appeared to fill more urgent military needs for the United States,

and TLAM-C, which was the last of the three missiles to be produced for the fleet, was also an afterthought from the standpoint of employment theory. Indeed, professional writers like Betts even suggested that TLAM-C's "high unit cost makes its military worth still debatable."[67]

Nevertheless, TLAM-C was the only missile of the Tomahawk family to see operational use. Neither the TASM nor the TLAM-N has ever been used in a real-world operation, and neither weapon is deployed in the fleet today. Starting with DESERT STORM in 1991, the conventional TLAM variant (hereinafter referred to simply as TLAM) began a career as the weapon of choice for the 1990s.

TLAM's schizophrenic development path presaged its use in the Gulf War, which turned out to be different from the purposes originally proposed for the Tomahawk family of missiles. Rather than being used in an antiship role, or to target airfields, or even as an agent of strategically compelling devastation, TLAM was used to assist in obtaining air and informational superiority over Iraq through attacking selected air defense and C2 targets. These uses echoed, in part, the anti-C2 and anti-airfield uses envisioned for both of the land attack Tomahawks in the 1980s, but with a significant difference. TLAM was not employed in the Gulf War as a strategically decisive weapon, in the sense of compelling the enemy to give up his purpose due primarily to the weapon's devastating effect. It was used instead in operational and tactical roles, as one of several tools to achieve intermediate objectives in an overall campaign. This employment concept did correlate in spirit with the proposed use of the TLAM-C in the 1980s, but with a different target set.

The Navy expended 288 TLAMs in DESERT STORM, of which 282 transitioned to cruise flight (six failed after launch). The missiles, which attacked thirty-eight separate targets, were between 60 and 70 percent effective in hitting their targets, by a revised 1997 estimate of the General Accounting Office.[68] TLAMs were used against targets in eight of twelve target categories in DESERT STORM,[69] but by far the great preponderance of their use was against four of those target categories: Iraqi air defense; command, control and communications (C3); government centers; and electrical power facilities.

TLAM was used in two principal ways: for degrading and destroying Iraqi air defenses and air defense C2 in preparation for manned aircraft attacks and for attacking specific heavily-defended targets for which the risk of attacking with manned bombers was considered too high. Incorporating the TLAM hit success rate with the progressive achievement of campaign objectives, the postwar assessment of Tomahawk performance is that the missile contributed to attainment of victory overall as a successful, and in some ways unique, component of airpower. Of the five major objectives of the air campaign (Phase I of the overall campaign)--disrupting Iraqi leadership and C2; achieving air superiority; cutting Iraqi lines of communication (LOCs); destroying Iraq's nuclear, biological, and chemical (NBC) capability; and destroying the Republican Guard--TLAM contributed uniquely to the first two.[70]

The TLAM contribution to disrupting Iraqi leadership was not, analysts point out, based on a superiority of explosive power with the TLAM warhead--rather, it was due to TLAM's suitability for use against leadership targets (civil government facilities), which

were both heavily defended, and located in highly populated areas.[71] The unmanned TLAM enabled the Coalition to strike at national leadership during the day (only LRMs-- TLAM and CALCM--were used for daylight strikes on Baghdad), and was expected to ensure greater accuracy than alternative weapons, and consequently less collateral damage around urban targets. From this perspective, given the concern of U.S. national command authorities about both unnecessary losses of American personnel and collateral damage, having the TLAM option made it much more likely that military planners would even choose to strike such leadership targets.

DESERT STORM attacks on Iraq's national leadership were assessed as effective at confusing and disorienting decisionmakers.[72] However, to the extent that the overall campaign originally hoped to compel the collapse of Iraqi will by disrupting the activities of national leaders,[73] achievement of this objective was inadequate to bring about victory: Iraqi will did not collapse when the chief damage to its leadership facilities was done, in the first three days of the air campaign (16-18 January 1991). In the case of DESERT STORM, at least, airpower, with its indispensable LRM component, failed to compel the enemy to give up his purpose. Additional attrition was required.

To prosecute a long-term air campaign, the Coalition needed air superiority in its theater of operations. Allied ability to achieve the objectives of the Phase I attack was dependent on unfettered access to Iraqi airspace; and once it was evident that disruption of national leadership would not produce a quick Iraqi surrender, the Coalition plan provided for intensified attacks on the other main Phase I objectives.[74] The TLAM's unique contribution to prosecution of the air campaign was its ability to degrade the

61

operations of the principal nodes of the Iraqi integrated air defense system (IADS) in the campaign's first few hours. Specifically, coordination of TLAM strikes with manned bomber sorties enabled Coalition aircraft to approach their first-day targets through air corridors in which TLAM had disrupted IADS operation only minutes before.

This coordinated approach to air attack was highly effective for securing the air superiority necessary for strategic attack (i.e., attack on Iraqi national targets such as leadership, communications, economic infrastructure, and NBC facilities). As the 1997 GAO report observes, however, it was not as effective for achieving local air superiority in tactical battle field areas during the ground campaign. Although the national IADS had been rendered inoperable by the air campaign, some individual SAM and AAA sites remained operational throughout the war, and posed a threat to close air support aircraft even on the last day of the ground campaign.[75] The master air attack plan had essentially ensured this by focusing on destruction of a few key nodes in the IADS rather than on striking dozens of individual air defense sites.[76] Thus, in this particular case, the Coalition's failure to achieve absolute air superiority was due to the design of its strike plan; it reflects neither on the generic efficacy of airpower, nor the specific effectiveness of LRMs.

TLAMs contributed, as a component of airpower, to the other objectives of the DESERT STORM air campaign (cutting LOCs, destroying Iraq NBC capability, and destroying the Republican Guard), but to a lesser degree, and not uniquely. Thus, it is evident that in the Gulf War, TLAM was regarded as a component of airpower that was unique for some purposes, and suitable for most, but not decisive in and of itself, in the

sense that it could compel the enemy to give up his purpose when used in isolation. Given how it was regarded, and the uses to which it was put, what can be concluded about the categories its effects fall into based on its Gulf War employment?

First, TLAM was clearly used in the initial air campaign for the tactical purpose of enabling follow-on aircraft to maneuver, in the same sense discussed in chapter 4 with respect to ATACMS. TLAM's suppression of Iraqi IADS was a key factor in facilitating the early and successful bombardment of high-payoff national targets by Coalition aircraft. Moreover, had TLAM not been available, it would not have been possible to degrade IADS operation as quickly, or with as little risk to friendly forces, as TLAM permitted. From this perspective, TLAM can be said to have fulfilled General Bailey's purpose for indirect fire: to facilitate maneuver, and thus to place the enemy at a disadvantage.

The use of TLAM to attack national leadership targets, however, is more ambiguous of interpretation. The major studies of Gulf War airpower unanimously conclude that, in the absence of LRMs, these targets probably would not even have been struck--the cost, in Coalition lives and aircraft, of attacking them by other means, especially during the optimum hours of daylight (when Iraqi leaders were most likely to be present), being simply too high, at least until other targeting options had been exhausted. This conclusion suggests that the effect of TLAMs on this aspect of the campaign was significant; and from the standpoint of target choices it clearly was. What is notable, however, is that the attack on Iraqi national leadership, while it achieved the operational objective of Phase I of the campaign--and was uniquely attributable to the

availability of LRMs--nevertheless did not compel Iraq to give up her purpose and accede to the Coalition's demands.

TLAM attacks on national leadership targets, as a type of missile use, seem at first glance to fall into the category of strategic intimidation. It would be hard to argue, certainly, that they represent a form of indirect fire to facilitate maneuver. The assumption behind such strikes is related more directly to the targeting of national will, with the echoes of Douhet that philosophy evokes. Two points may be made about this construct, however. First, if breaking down national will with missile attacks was the motivation behind using TLAMs on Iraqi leadership targets, it did not work. Six more weeks of fighting, including a ground campaign, were required to achieve this objective.

Second, a subtle shift in thinking about the philosophy of attacking national will, as a method of war, had occurred in the years prior to DESERT STORM. From Douhet to nuclear diplomacy and mutual assured destruction, most of the twentieth century had seen a focus on terror against populations as the principal means of affecting national will. During the 1970s and 1980s, however, American military planners had begun in earnest to analyze the C2 arrangements of the Soviet Union, and had concluded that targeting vital communications and leadership centers might very well so confuse and demoralize Soviet decisionmakers that the national authorities, recognizing that they could no longer control their own forces, would be inclined to halt the conflict.[77]

In DESERT STORM, the targeting of Iraqi national will through attacks on leadership facilities was a product not of terror-based intimidation models, but of this evolving discipline of warfare, soon to be christened Information Warfare (IW). IW

64

attacks, as the phases and target sets of the DESERT STORM campaign plan reveal, took their place alongside attacks on economic infrastructure and tactical ground formations as an equal form of damage to the enemy. It was not necessarily assumed that attacking the national will would have an effect superior to, or more coercive than, attacking Iraq's elite Republican Guard troops. Some remnant of the Douhetan predisposition to believe that it might is evident in the fact that the campaign did envision a phasing of target sets within Phase I: national leadership facilities were struck first, with follow-on strikes on other targets occurring if Iraq's will were not crushed by the attacks on leadership.[78] But the fact that the campaign was nevertheless prepared to methodically attack all relevant targets, makes it clear that the old Douhetan focus of airpower enthusiasts on compelling the enemy through terrorizing him had been superseded.

Thus, a principal lesson of LRM use in the Gulf War is that it was uniquely suitable for application to a new target set--one that represented a form of coercion at the operational level of war, but could not be equated to the paradigm of terror-based strategic-level intimidation which had prevailed in military thinking since the advent of airpower. This form of coercion, it is important to note, was considered but one element of a coordinated campaign to eliminate the opponent's options. By itself, it demonstrably did not have a decisive effect in compelling the opponent to give up his purpose; but it was not seriously intended to. Instead, as experimental as much of the leadership targeting was, it was predicated on an assumption that it would probably have a compelling effect only in conjunction with systematic attacks on other types of targets.

It is worth reiterating that this lesson has specific implications for LRMs--because LRMs are uniquely suited for attack on leadership targets. Such targets are typically surrounded by civilian structures in congested urban areas, meaning that collateral damage can only be avoided by extremely precise guidance. They are also, in general, heavily defended along the natural avenues of air approach, which implies that attacking them is a high-risk task for manned bombers. Thus, the aim of modern IW to disrupt national leadership is not merely compatible with the advantages of LRMs--it is actually contingent on them.

Assuming that, in the context of IW, LRM attacks on national leadership are not necessarily an attempt to compel the enemy with a single intimidating blow, it is useful to inquire whether they are, alternatively, a form of indirect fire to facilitate maneuver. In the normal sense of the term they are not. *Maneuver*, as a principle of war, and maneuver as an element of combat power are both defined in terms of physical movement in relation to the enemy which puts him at a disadvantage.[79] However, it is instructive to consider this question in light of the conclusion from chapter 4 about theories of ATACMS use against SCUD missiles.

The conclusion of chapter 4 was that ATACMS' capabilities suggested a particular fitness for a role in the Attack Operations component of theater missile defense (that is, the component which emphasizes locating and destroying the systems that enable the opponent to launch theater ballistic missiles). This was considered a separate form of LRM use, distinct from both indirect fire in support of maneuver, and strategic intimidation. Its primary characteristic was a defensive orientation toward preventing the

opponent from using his missile capability against one's own will to continue the fight. Interestingly, although the use of TLAM against Iraq's national leadership was conceived of as a form of offensive action, it had a defensive effect similar to the projected effect of ATACMS on an enemy's use if missiles: it reduced considerably Iraq's ability to go on the offensive through sound, responsive, and coordinated national decision-making.

The ATACMS proposal for SCUD attack, and the use of TLAM against Iraq's leadership infrastructure, need not, however, be identical in purpose or effect to be similar items in an evolving category. That category relates to LRM employment, and is defined by the following characteristics: First, it is not a form of indirect fire to facilitate maneuver. Second, it is not a form of intimidating or coercing an enemy merely by inflicting a single kind of insupportable strategic damage on him. This category of attack is not conceived of as a death blow in and of itself. Third, LRMs of one kind or another are uniquely suited for this type of attack. Finally, although catastrophic intimidation is not the immediate goal, LRM attacks in this category are oriented toward national will in one way or another, either defending one's own against the strategic-level effects of the enemy, or causing the enemy's to be undermined by methodical attacks on his infrastructure for information and execution.

Perhaps the most useful perspective on this developing category of LRM use is its contrast with the traditional *maneuver* principle of war. In its purest sense, *maneuver* could encompass any action one takes to put the enemy at a disadvantage, or exploit the inherent advantage created for oneself by such actions. *Maneuver* has a specific connotation of physical movement in its accepted formulation, however; and its

67

definition refers specifically to the movement of *forces* as well. It is thus focused on optimizing terrain-oriented movement in relation to the enemy. The trend of observations about LRM employment in the last two chapters suggests that LRMs, in light of the capabilities they imply to generate advantages and disadvantages unrelated to the physical juxtaposition of forces, may ultimately demand a revised principle of war to replace conventional *maneuver*.

What light does the TLAM example in DESERT STORM shed on the other principles of war? As we might expect, the results are similar to those in the ATACMS analysis. TLAM supported *security* by its reduction of risk to own forces. Like ATACMS, it enhanced *economy of force*, streamlining the coordination and preparation load required to achieve the effects of a precision-guided munition (PGM) strike, in comparison with manned aircraft. In terms of the spectrum of resources needed to employ the weapon--such as data dissemination capacity and national sensor support to the targeting cycle--TLAM offered no advantages over aircraft-delivered tactical munitions, and in some cases was more resource-intensive.[80]

TLAM improves operational *simplicity*, even though as a technological solution it is not a simple gadget to deploy or operate. Nevertheless, as a component of a campaign TLAM simplifies planning because of all the tactical support and coordination it eliminates. In this way it also, like ATACMS, supports an undistracted approach to the *objective*, and discourages the expenditure of unnecessary effort on actions that do not contribute directly to achieving it. TLAM gives no particular new meaning to the principles of *offensive, mass*, and *surprise*; neither does it detract from them in any way.

68

Finally, use of the TLAM can be said to have enhanced *unity of command*, to the extent that it ensured that initiatives with combat effects would not be undertaken outside of the specific command and authorization of the joint force commander himself. Unlike manned aircraft, ships at sea, and ground maneuver forces, which often encounter the opponent and engage him permissively, but not at specific direction, the TLAM invites no such chance consequences. Having no power to make ad hoc decisions, it proceeds as directed toward its target--a target selected and approved by the JFC--and will either hit it or not; but it will not return to base with any stories to tell. It is interesting to note that government and military professionals have made little of this advantage of the TLAM for *unity of command*, but defense industry editorialists have routinely assumed it to be significant.[81]

It is important to return to one observation before moving on to an assessment of TLAM's performance in Operation DELIBERATE FORCE. That observation is that, although TLAM continued ATACMS' trend toward a concept of employment against targets with strategic impact, the impact actually obtained by using TLAMs to strike Iraqi national leadership targets did not stand on its own in terms of compelling the enemy. It was, rather, an interdependent impact, which achieved the desired compulsion of Iraq only in conjunction with a broader campaign of attacking other traditional airpower targets (e.g., military and economic infrastructure). Attacks on the other targets themselves were equally effective whether conducted by TLAM or aircraft-delivered munitions; if TLAM had an identifiable effect on the servicing of those targets, it was in the unprecedented rapidity with which Coalition air superiority, facilitated by early

TLAM strikes on the Iraqi IADS, enabled the JFACC to mount debilitating attacks on them.

TLAM next saw integrated use in an air campaign in September 1995, when NATO launched Operation DELIBERATE FORCE against the Serb faction in Bosnia-Herzegovina. DELIBERATE FORCE provides a unique opportunity to evaluate the contributions of LRMs, in the sense that it is the single most widely used--and arguably, in fact, the only--example of successfully compelling an opponent to give up his purpose through the application of airpower.

DELIBERATE FORCE comprised a campaign of bombardment for the objective of compelling the Bosnian Serb leadership to release thousands of Muslims being detained, and some even executed, in United Nations (UN)-protected safe enclaves in southeastern Bosnia; and to remove Bosnian Serb Army (VRK) artillery from threatening positions around cities and Bosnian (Muslim) Army assembly areas throughout the country. By far the overwhelming majority of strikes in the campaign were conducted by manned bombers from four NATO nations. Out of a total of 708 hits attempted with precision-guided munitions (PGMs), only thirteen were with TLAMs. PGMs were used against a variety of targets, most commonly air defense and C2 sites, along with Bosnian Serb military infrastructure facilities, such as ordnance warehouses and repair depots. Another 318 unguided bombs were expended, primarily on such targets as airfields and freight yards.[82]

TLAMs themselves were used on a small number of targets (eight), and only late in the campaign. The first NATO strike was conducted on 30 August 1995, and the

thirteen-missile TLAM volley did not occur until 10 September. The great majority of the air strikes in DELIBERATE FORCE, which ended 14 September, occurred before TLAMs were used. Thus, one conclusion from DELIBERATE FORCE is that TLAMs were not employed in one of their DESERT STORM roles: unmanned (meaning lower-risk) suppression of enemy air defense in the earliest hours of the campaign.

A comparison of TLAM use in DELIBERATE FORCE with DESERT STORM does, however, reveal some similarities. Moreover, the same comparison suggests an interesting difference. With respect to similarities, the eight DELIBERATE FORCE targets attacked with TLAMs were, in fact, air defense and C2 targets in northwestern Bosnia.[83] In addition, they were struck with TLAMs largely because aircrews flying over the area suspected Serb AAA gunners of producing flak trails to lure NATO attack aircraft into unlocated SAM nests, a threat of less concern to TLAMs. Of particular significance in the TLAM attack were two facts: first, that TLAMs were a lower-risk method of eliminating components of the Bosnian Serb IADS in northwest Bosnia (and were, like similar attacks in DESERT STORM, coordinated with follow-on attacks by Navy and Air Force bombers); and second, that Bosnia's northwest sector was strategically significant because of its proximity to the NATO airbases in Italy. Like the air approach corridors south of Baghdad, northwest Bosnia was a vantage point from which Serb early warning radars could detect NATO aircraft well before those aircraft brought Serb targets within their circles of lethality (in fact, almost as soon as they took off from Italy). This early warning capability amounted not just to a perception of tactical or operational advantage for the Serbs, which they could exploit with initiatives

71

such as deceptive flak trails, but to their strategically vital sense of inviolability as a nation that could still defend itself.

Thus, the Bosnian Serbs' IADS in northwest Bosnia, centered on the Lisina early warning complex, had greater significance than its components would individually imply. Being able to see, track, and analyze the attacking air forces probably gave the Bosnian Serbs a psychological confidence similar to that accorded the English by their use of radar during the Battle of Britain in 1940. As long as the Serbs could see and understand their operational picture, they retained a sense of control over events--a sense that may have been wholly or partly illusory, but nevertheless had an impact on decision-making. That the U.S. decision to use the Tomahawk, and to use it on the northwest Bosnian IADS, was influenced by this analysis is indicated in both professional writing and the author's own experience as a participant in DELIBERATE FORCE.[84]

It is worth noting that the timing of the TLAM strikes was also closely coordinated with diplomatic initiatives. During the campaign the Serbs requested that bombing be halted on two occasions, offering the promise of talks to secure a negotiated cease-fire. The second request was made on 10 September, and French General Janvier, UN Protection Force (UNPROFOR) Commander, responded immediately by meeting with the Bosnian Serb Army Commander in Belgrade. Upon determining that the Bosnian Serb position remained hostile and intransigent, Janvier returned to his headquarters, with the TLAM strike being launched within moments of his departure from Belgrade.

This set of expectations and events thus reinforces TLAM's DESERT STORM role in attacking both air defense targets, as a SEAD measure, and C2 or IW targets for the purpose of undermining the opponent's national will. The interesting difference in the DELIBERATE FORCE attack is its result. Whereas the DESERT STORM attacks on Iraqi leadership targets did not have an immediate and distinguishable effect on Iraqi will, the Bosnian Serbs capitulated shortly after their northwest sector's IADS was eliminated, and with little additional NATO ordnance being expended against them.[85] Even analysts who attribute this prompt capitulation more to the cumulative effect of two weeks of bombing than to the elimination of one IW system, nevertheless interpret the attack on the northwest sector IADS as the specific catalyst for Bosnian Serb agreement to NATO terms.

It is not the purpose of this thesis to inquire into why striking IW targets had effects at different levels in DESERT STORM and DELIBERATE FORCE, although some possibilities may be advanced. Excellent reasons are probably to be found in the differing capacities of Saddam Hussein and the Bosnian Serbs to threaten the forces attacking them at any level of war. While Saddam still had options like the strategic use of ballistic missiles against civilians after his leadership facilities had been destroyed, and enjoyed the advantage of the defensive position in the impending ground war, the Serbs had no such alternatives for putting NATO at a disadvantage. Their traditional method of psychological intimidation, the taking of hostages, had proven resoundingly unpopular with world opinion during the summer of 1995,[86] and would be unlikely to produce conditions favorable to their cause.

Moreover, a subtle difference in the prosecution of the Gulf War and Bosnian air campaigns may also have been a key factor in the comparative decisiveness of the TLAM attack in 1995: that is, the decision of NATO to suppress Serb air defenses nonlethally, rather than destroy them, throughout most of the campaign.[87] It can be argued that while their C2 and air defense capabilities remained operational, the Bosnian Serbs viewed their position as tenable; the psychological blow of losing the IADS on their most vital axis of homeland defense after they had survived two weeks of bombing was intensified precisely because it had not been taken away from them in the first hours of the campaign.

Regardless of the specific interpretation of IW targeting effectiveness, the point for this thesis is that, in the circumstances of the Bosnia air campaign, a TLAM strike on an IW target contributed both distinctively and directly to achieving the campaign's ultimate objective: compelling the Serbs to agree to NATO terms. This amounts to information that it is possible for an LRM attack on IW targets to compel an enemy to give up his purpose, even if, as DESERT STORM demonstrated, it is not inevitable. Two aspects of this lesson should be reiterated. First, the TLAM strike was conducted near the end of a broader air campaign which attacked a variety of targets. The role of the IADS strike as a specific catalyst for the Serbs' capitulation should not overshadow this fact; the most supportable conclusion, and one which fits both the Gulf War and the Bosnia campaign, is that LRM strikes are effective in conjunction with manned air strikes rather than in isolation.

Second, the TLAM strike was undertaken because attacking the IADS in northwestern Bosnia was too high-risk a task for manned bombers. LRMs were necessary for this strike to be conducted at an acceptable level of risk. As a SEAD measure in support of follow-on manned air attacks this aspect of TLAM use mirrors that of DESERT STORM. And to the extent that the IADS attack served to undermine the Bosnian Serbs' will to continue the fight, it also qualifies as a use of TLAM to produce a strategic effect through targeting IW facilities. That it had this effect is undisputed by analysts; that this effect was specifically intended is less sure, although the timing of the TLAM strike in relation to General Janvier's unproductive negotiations in Belgrade is clearly an attempt, in the tradition of the American bombings during the Vietnam War, to send a signal meant for the opponent's leadership.

The lessons of DELIBERATE FORCE for LRM use in relation to the principles of war do not differ significantly from the lessons of DESERT STORM. In Bosnia TLAM is again found enhancing *security* and *economy of force*, as well as improving operational *simplicity* and embodying the benefits of *unity of command*. (CINCSOUTH's ability to coordinate the IADS strike so precisely with the Belgrade negotiations testifies to this *unity of command*, which becomes diffused as soon as tactical exigencies are encountered by subordinate commanders, such as air squadron commanders and strike leaders.) The lessons of TLAM for the other principles of war are the same for Bosnia as for DESERT STORM.

However, a cumulative lesson of both conflicts about TLAM was that TLAM lacked certain aspects of responsiveness that inhere with airpower: namely, the ability to

process precision guidance for targets, and revised operational commands, as quickly as the situation changed. Specifically, the preparation of mission information to guide a TLAM to its target required days, rather than the hours needed by tactical air planners. It was also completely dependent on the functioning of a complex infrastructure of national sensors, high-data-rate processing and dissemination hardware, and support facilities located at only two places in the United States. Furthermore, significant--and inflexible-- lead-time was required to actually issue and execute the command to launch a Tomahawk, a legacy of the Cold War's expectation of early warning, at long range, of Soviet provocations. Finally, a TLAM, once launched, could not be recalled--a potential for disaster much more avoidable with manned aircraft and modern C2 systems.

These features of the Tomahawk are shortcomings primarily from the standpoint of operational flexibility, well-expressed in the Army's concept of agility as a tenet of operations.[88] Agility, according to FM 100-5, is "the ability of friendly forces to react faster than the enemy and is a prerequisite for seizing and holding the initiative." The time delays inherent in using TLAMs can thus, in spite of TLAM's advantages, produce a reduction in agility for a joint force commander. TLAM's proponents in the Department of Defense (DOD) have recognized this deficiency, and since DELIBERATE FORCE have introduced several measures to correct it; eventually, it is predicted, new variants of the TLAM will dispense altogether with cumbersome requirements for guidance and C2.

What is interesting about this aspect of the TLAM, however, is its contrast with the ATACMS. ATACMS, as indicated in chapter 4, actually represented an improvement over aircraft-based alternatives in terms of agility: its guidance

requirements were less dependent on remote sensor support and data from external sources, and its operational use was thus considerably more responsive, without sacrificing precision. The lesson from this is that different LRMs may bring the same basic advantages--such as precision and reduced risk to own forces--without having an identical impact on operations at all levels. ATACMS, as demonstrated, was problematic for *unity of command*, but significantly improved agility. TLAM, on the other hand, enhances *unity of command* more effectively than virtually any other weapon system employed by the U.S. armed forces, but in its current incarnation requires some sacrifice of agility for a JFC.

This is one of the lessons that may be summarized from the survey of tactical and operational employment of LRMs. The other major lessons are summarized below.

First, both TLAM and ATACMS are used, and are effective, in the role of indirect fire to support maneuver described by General Bailey. Making this assessment depends on a flexible definition of maneuver as encompassing air force maneuver as well as ground force maneuver. If maneuver is considered to have the objectives and characteristics of the joint principle of war, *maneuver*--namely that it is force movement intended to place the enemy at a disadvantage and exploit the relative advantages that result--this definition is acceptable and has analytical value at both the tactical and operational levels of war. Use in a SEAD role is the common denominator of this form of employment for both weapons.

Second, both demonstrated capabilities and credible theory suggest that ATACMS and TLAM have a unique capacity to strike targets whose elimination

produces strategic effects. In the case of ATACMS the proposed target set is mobile ballistic missile systems; for the TLAM the target set encompasses a wider range of national-level IW-related facilities, from civilian leadership infrastructure to critical early warning systems. As we have shown, analysis and speculation both focus on the unique aspects of these LRMs which make them suitable for attacking such targets. A corollary to this conclusion is that, without the advantages brought by LRMs, the targets would be less susceptible to attack, and the JFC's options for prosecuting a war decisively would be thereby reduced.

Nevertheless, a third significant lesson is that neither LRM has demonstrated an ability to compel the enemy to give up his purpose through isolated use of the weapon, even when it is used against strategic-level targets, and even when it does, in fact, produce the expected effects (i.e., blinding, confusing, or disrupting enemy decision-makers).

Finally, a synthesis of these second and third lessons suggests that there may be an evolving category of missile use that does not fit either the traditional, tactically oriented indirect fire formulation of General Bailey, or the Douhetan, Cold War-era concept of missiles as agents of intimidation the strategic level. This emerging category differs from indirect fire in that it does not facilitate any traditional form of physical maneuver; and it differs from strategic-level intimidation by not being effective by itself, but rather through an integrated approach in which LRM use may be focused on targets affecting national will, but the enemy is compelled by such attacks only in combination with other types of attrition. This analysis of LRM use also suggests that one of the most

enduring principles of war, *maneuver*, may require revision in the age of LRMs. Though they have not proven decisive by themselves, LRMs would seem to have proven that they represent a specific method other than terrain-oriented maneuver by which to put an opponent at a disadvantage.

CHAPTER 6

ANALYSIS--STRATEGIC LEVEL OF WAR

Between January 1993 and August 1998, the United States launched 178 TLAMs

and thirteen conventional air-launched cruise missiles (CALCM) at three countries--Iraq,

Sudan, and Afghanistan--which had, in one way or another, incurred the disapproval of

the U.S. National Command Authorities (NCA). The cumulative political effect of these

strikes, which occurred at four separate times, prompted the coining of a new expression

in popular punditry: cruise missile diplomacy. Writers on cruise missile diplomacy

invariably invoke Clausewitz's famous aphorism that "war is a continuation of political

intercourse, carried on by other means."[89] There is little dispute among Western military

and political thinkers that this is so; what may be disputed, however, is the applicability

of this dictum to cruise missile diplomacy.

The idea of cruise missile diplomacy, and appointment of the long-range cruise

missile as the weapon of choice for those delicate diplomatic initiatives which require

precision-guided munitions, have been accepted in the consciousness of both military

professionals and civilian theorists with little attempt to specify what the choice is for.

When an American president orders the launching of LRMs--a military weapon--at a

country with which America is not engaged in combat, how may the objectives he does it

for be categorized? Whether or not they are objectives for which a missile is the

optimum tool (an analysis beyond the scope of this thesis), can we evaluate the

effectiveness of LRMs afterward, in terms of achieving the objectives of the strike?

Chapter 6 answers these questions in light of the four real-world LRM strikes in the 1993-1998 period, and the lessons learned about LRM use from the tactical and operational levels of war. One thing demands attention at the outset: the fact that by the commonly understood definition of war, long-range cruise missile strikes may be a continuation of political intercourse by other means, but they are not war. Perhaps this means that the traditional definition of war is inadequate to account for modern means and ends. It may also, more subtly, mean that LRMs have created a new situation in which a military means may be used for a political end, but not necessarily in a traditional military way. Investigation of the 1990s LRM strikes will help to determine whether this formulation is valid.

The first of the LRM strikes, which this thesis will refer to for brevity as the diplomatic strikes, occurred in the twilight of the Bush Administration, on 17 January 1993.[90] On that day Navy ships launched forty-five TLAMs at the Zaafaraniyah industrial facility in a suburb of Baghdad--a facility where the International Atomic Energy Agency (IAEA) believed uranium enrichment equipment, which provided nuclear weapons components, was manufactured. This strike was conducted during a week-long series of manned bomber attacks on Iraqi SAM sites in the United Nations (UN)-imposed no-fly zone in southern Iraq. The bomber attacks were the first since DESERT STORM, and were analyzed as having some relation to the TLAM strike, but not a direct one in the sense of either series of attacks fulfilling a military purpose for the other.

The purpose of the manned bomber raids was to compel Iraqi compliance with UN requirements for the no-fly zone (NFZ). On 6 January, a week before the first air

attack, the UN had instructed Iraq to remove its anti-air systems from the NFZ. With Iraq's failure to comply established by coalition[91] intelligence, U.S. and allied aircraft began attacking SAM sites in the NFZ on 13 January. During the brief campaign in the NFZ, the TLAM strike was launched on Zaafaraniyah, without prior announcement or issuance of any ultimatum to Saddam Hussein. International reaction was predominantly unfavorable. The strike was regarded variously as peremptory, highhanded, and politically incontinent.[92] Moderate collateral damage, magnified assiduously by Saddam's media efforts, was viewed as discreditable to both U.S. prestige and U.S. missiles. Ultimately, although large portions of the Zaafaraniyah facility were destroyed or severely damaged in the strike, the summary of Timothy Sparks speaks for most assessments: "Politically and militarily, the 17 January cruise missile strike on Zaafaraniyah is difficult to justify."[93]

Politically, the strike received much disapprobation, but the hostility toward it appears to have been more a function of U.S. failure to lay diplomatic groundwork in advance than of an objection to its target, or even its timing. Zaafaraniyah was generally accepted, based on the IAEA assessment, as a facility which could enable Saddam to produce nuclear weapons components; if not immediately, then shortly after any lifting of UN sanctions. There was a question about the current readiness of the fabrication plant to make the weapon components at issue, but none about the nature and potential of the facility. The tone of political rhetoric after the TLAM strike emphasized that the U.S. action was insufficiently consultative rather than that the target posed an insufficient threat.

Using the idea of strategic airpower, as a military tool of national policy, for an analytical framework, the Zaafaraniyah strike can be compared most usefully to the Israeli strike on Iraq's nuclear reactor at Osirak in 1981. Zaafaraniyah was not, perhaps, the urgent threat to Gulf security that Israel believed the Osirak reactor was to hers, based on Israeli intelligence, at the time of the strike, that the reactor was to become operational within weeks.[94] In terms of a strategic air strike as a military action, however, the Zaafaraniyah strike really fits into no other category. It was an isolated attack on a single facility which threatened to confer on an enemy the ability to wage nuclear war. The urgency of the strike might be questioned, but its legitimacy was a political rather than a military issue.

It is possible that launching the TLAM strike concurrently with the tactical aircraft (TACAIR) attacks in the southern NFZ clouded the entire political message of the attack on Zaafaraniyah, by implying either an operational military association, or a coercive political association, that did not actually exist between the two strike efforts. From a military standpoint, the separate strike efforts were indifferent to each other. Unlike the standard for integrated use in DESERT STORM, TLAMs were used on Zaafaraniyah entirely without reference to the TACAIR missions in the south. Neither strike package depended on or affected the other, except for showing up on the same air tasking order. Similarly, the intended political effect of each strike effort was distinct and not obviously interrelated. It was neither stated nor implied by the U.S. that the Zaafaraniyah strike was intended to more effectively compel Saddam to comply with the NFZ provisions than TACAIR alone, nor is it evident that destroying an unused nuclear

fabrication plant in Iraq's capital would indeed have any such effect. Likewise, there is no obvious political link between attacking Iraqi SAMs in the NFZ and compelling Saddam to relinquish his nuclear ambitions.

The status of the two strike efforts as simultaneous, but not integrated to optimize the purpose of either, prevents an interpretation of their concurrence as the feature of a military campaign. Mark Conversino advocates the category of strategic attack for airpower strikes which fit uneasily into other groupings,[95] and this will be adequate for the purposes of this thesis, with the following qualification: in the case of Zaafaraniyah, the attack was intended not to compel the enemy to do or not do something, but straightforwardly to destroy his means to do it. In other words, although such an attack has consequences at the strategic level (Iraq cannot threaten its neighbors with nuclear weapons), it does not target national will per se.

Analysts speculated in 1993 that the strike on Zaafaraniyah was, in fact, intended to do precisely that.[96] The U.S. motive was suggested to be signaling Saddam that "Baghdad itself was in danger from Mr. Hussein's defiance,"[97] a message deemed to be psychological and therefore directed at Saddam's will to resist UN requirements. Such a conclusion does a disservice to further analytical efforts, however--as amply demonstrated by a continuing inability to make sense of what LRMs should actually be used for. By ascribing politically intimidating motives to individual military actions, as their primary impetus, this school of thought dismisses the simplest explanation for the strike on Zaafaraniyah: that U.S. NCA primarily wanted to destroy it because it posed a unique threat to Gulf security.

Not even a novice at information warfare has to be diverted from sound analysis by the speculative premise that a military action with a straightforward result was undertaken for a convoluted purpose. It is quite probable that the main (if not the only) signal intended for Saddam with the Zaafaraniyah strike was not "Baghdad is at risk," but "You have just lost your ability to manufacture nuclear weapons components." This conclusion would have the virtue of according with the intention actually expressed by U.S. NCA,[98] and perhaps more significantly, with the target selection. That Baghdad was at risk was a lesson Saddam could hardly have failed to learn in 1991; a missile strike on a facility in its suburbs did not tell him anything he did not already know. By contrast, U.S. planners had shown a disposition to target national command and civilian political facilities as the means of affecting Iraq's national will during DESERT STORM. Sending signals to coerce Saddam was associated with targets like presidential palaces-- as discussed in chapter 5, infrastructure targets like fabrication plants were attacked for the purpose of attrition.

Assessing the Zaafaraniyah strike as an infrastructure attack presents the opportunity to draw some useful lessons from it (in contrast to the political interpretation, which confuses the correlation between intended effect and result). First, the attack did succeed in destroying most of the fabrication facility.[99] Six years later, Iraq is still assessed to be unable to produce a nuclear device of any kind indigenously. From this limited perspective the attack was a success, although executing it independently it had a political cost for the U.S.

Second, the Zaafaraniyah strike was truly LRM-unique, in that it was carried out solely with TLAMs, not in support of other maneuver forces, or of a larger campaign objective, but for the single objective of the strike: to destroy the fabrication plant. Moreover, TLAM was, as in the operational air campaigns reviewed in chapter 5, selected for the strike because of the unacceptable hazard to manned aircraft. The availability of TLAM allowed the strike; to the extent that the U.S. might avoid such strikes if they could only be executed with manned bombers, the use of TLAM may be said to have improved prospects for Gulf security by eliminating a destabilizing Iraqi capability that might not otherwise have been attacked.

Clearly, with respect to the paradigms of indirect fire and strategic intimidation, the Zaafaraniyah strike fits poorly into either category of LRM employment. Indirect fire to support maneuver may be dismissed immediately because there was no maneuver to be supported. Even in terms of political advantage or disadvantage (as opposed to tactical military advantage), the strike yielded none to be exploited, nor was it likely to do so. It was not an attack designed to leave Saddam confused, disrupted, or conciliatory (i.e., compelled through terror or even loss of information effectiveness), but merely less well-equipped. In the context of his regional environment, being stripped of an incipient nuclear weapons capability did not put him at a strategic disadvantage; rather, it prevented him from gaining an advantage no one else had. The benefit of the strike was primarily attritional, in that it targeted not intention but capability.

This analysis suggests that, as observed in Chapter 5, LRM effectiveness is highly correlated with use against targets which produce advantage or disadvantage outside of

traditional military concepts. The first of the diplomatic strikes shares two interesting

characteristics with tactical and operational-level LRM strikes. On the one hand, LRMs

are peculiarly suited, across the board, to attacks which can have an effect without a

maneuver component. Eliminating SCUD launchers, eliminating a nuclear

manufacturing capability, and even degrading national will through attrition of high-value

informational assets, such as critical early warning sites or facilities symbolic of political

power, are all objectives which can be achieved without territorial maneuver. They may

require coordinated aerial bombardment, but this simply equates to another means of

attrition.

The second common element is found in the measure of effectiveness for the

strikes--that is, the expected gain or loss of advantage due to the level of attrition. Loss to

the enemy of one SCUD battery produces little disadvantage for him if he has twelve

more conveniently located; but conversely, loss of his only nuclear manufacturing facility

could put him at a severe disadvantage in given circumstances, such as when his

neighbors can produce or acquire nuclear weapons. This attritional index of advantage

fits comfortably into Conversino's outline of strategic attack, as well as into Joint Chiefs

of Staff doctrine articulated for joint task force targeting operations[100]--a good indicator

that this lesson will have practical as well as academic value.

Specifically, joint doctrine envisions the entire doctrinal targeting cycle as

essentially a closed loop. Targeting seeks to inflict designated amounts of damage on

targets or target systems (such as IADS or electrical power infrastructure), and assesses

the effectiveness of the process in terms of how much damage was achieved. This

targeting approach is predicated on--and encourages--attritional analysis of an enemy, with the purpose of determining levels of attrition at which decisive enemy disadvantages--or decisive friendly advantages--may emerge. It translates practically into attritional bar-chart models for combat assessment in joint task force exercises, such as those sponsored by U.S. Atlantic Command (ACOM) in its force provider role.[101]

By far the most widely used attrition-based index is that employed for predicting when air superiority will be achieved in a joint campaign. This index is typically composed of ten or fewer key elements of airpower and air defense, such as number of operational enemy fighters, number of bombers, percentage of fuel facilities operational, percentage of SAM sites operational, and so forth. Recording attrition of the enemy is more than a matter of watching the colored areas of bar graphs decline: commanders regard the critical level of enemy attrition at which they achieve air superiority as a decisive point, in the sense that it "provides the commander with a marked advantage over the enemy and greatly influences the outcome of [the] action."[102]

This JTF-oriented interpretation of decisive point differs from the Army's traditional definition, which indicates that a decisive point is often either geographic in nature (e.g., key terrain), or is identifiable as an individual physical thing such as a vital communications node. An attritional decisive point typically has little relevance for ground planning--in ground force terms, either the force holds key terrain or it does not-- but it can be extremely useful as a predictive index for the thresholds of influences which are not subordinated to geography, such as national will, the ability to project a nuclear threat, and the ability to process information.

This existing analytical framework for assessing the progress of attritional campaigns has significance as a means of mediating between General Bailey's concept of indirect fire, which is defined as supporting maneuver, and the Douhetan idea of airpower, which is defined as producing quick results due to the catastrophic, as opposed to incremental, nature of the damage inflicted. An attritional approach relies on airpower--either through LRMs or manned aircraft--but does not therefore seek only to gain strategic advantage through rapid, decisive blows. Instead, it focuses methodically on destroying and degrading a successively greater percentage of the enemy's capabilities, usually for the purpose of achieving eventual strategic advantage through intermediate operational advantage.

This framework correlates well with the effectiveness assessment for TLAMs from DESERT STORM and DELIBERATE FORCE, and fits the parameters of ATACMS' projected role in SCUD hunting. Of particular significance for the diplomatic strikes, the TLAM attack on Zaafaraniyah also fits the attritional framework nicely. The Zaafaraniyah strike did not produce a quick strategic result, such as changing Saddam's mind about complying with UN demands. It did, however, incrementally degrade Saddam's ability to threaten his neighbors with unconventional force.

With these observations in mind, analysis proceeds to the next of the diplomatic strikes. This strike, conducted with twenty-three TLAMs on 27 June 1993, targeted the Iraqi central intelligence headquarters in Baghdad. The pretext for this strike was retaliation for Iraq's attempt to assassinate former President Bush during his visit to Kuwait in April. No TACAIR strikes of any kind were underway at the time; the only

ordnance expended against Iraq on 27 June was a volley of TLAMs.[103] Moreover, the American purpose for the strike was bilateral rather than international. The U.S. was not acting as the agent of the UN, or exercising coalition leadership: it was simply retaliating as one nation against another.

In contrast with the January strike, the June 1993 attack was notable for its overt political character. President Clinton informed the UN that the U.S. was exercising its right under Article 51 of the UN Charter to defend itself, and made a point of the target selection as a measure of political intent: the Iraqi intelligence headquarters was struck because it was presumably where the assassination attempt on President Bush was planned.[104]

As the first TLAM strike ever launched in isolation from other forms of attack, the June 1993 strike seemed, by its nature, to confirm the early speculation of editorialists after the January strike about the tendency of LRM attacks to be a political phenomenon. The basis of this conjecture had its roots in the Cold War theory of missiles as terror weapons, and of their use as either unthinkable, or as a political statement, rather than as a military means to achieve a specific objective. In line with this theory, the strike on the Iraqi intelligence headquarters, which was of limited value from a military standpoint, appeared to be an attempt to terrorize Saddam through demonstrating America's awesome capacity to target his assets precisely and at will. While this thesis argues that such speculation has considerably less explanatory value than is widely believed, the June 1993 strike did nothing to dispel the myth. It is important to remember, however, that this strike can be confidently analyzed as a politically motivated attack because the

President said it was. Far from invoking any arguments about degrading Saddam's capabilities or eliminating a destabilizing weapons program, President Clinton informed his international audience that America was asserting the traditional national demand popularized in her Revolution: "Don't tread on me."[105]

For this strike as well as the January one, presidential comments on the strike's purpose and the target selected were internally consistent. There was no compelling reason, other than retaliation, for attacking the Iraqi intelligence headquarters at that time. It did not pose any undisclosed, potentially destabilizing threat to U.S. or coalition interests in the Gulf. Moreover, when the attack failed to inflict much damage on the structure, there was no restrike. Actual damage to the building was not the point; the strike's purpose had been achieved by its execution. The signal was sent to Saddam.

It is, of course, another question whether Saddam received the signal and what impact it had. It may be possible to gauge such effects, but in general they cannot be measured in terms relevant to military operations. The intelligence headquarters attack did not facilitate maneuver or even create an exploitable condition; it did not produce an immediate compelling effect on Iraqi will; and it did not inflict operationally or strategically significant attrition on a component of national power. The intelligence functions disrupted by the attack resumed within days. No further assassination plots against the president involving Iraqi perpetrators were reported by U.S. agencies, but this measure of effectiveness suffers from the virtual impossibility of proving that what was not reported did not happen.

The logic of political measures of effectiveness, as opposed to military, is beyond the scope of this thesis, but it is worth noting that the June 1993 strike makes clear that political endeavor, like military, operates according to internal imperatives of its own. Just as Clausewitz asserts a requirement for policy to accept that war has a set of peculiar means which must be respected, so it may be necessary on occasion to remind war that policy can levy a parallel requirement regarding its objectives. Political objectives may consider themselves well served by military means, even when employment of those means has little meaning in a military context.

If anything should be learned from the intelligence headquarters strike, it is that the low risk to personnel associated with TLAMs is probably the deciding factor in whether to use military means for purely political objectives. This theme is consistent for LRMs at all levels of war, but in the diplomatic strikes it is especially significant. Had it been necessary to send manned bombers into the heart of Baghdad to strike the intelligence facility, analysts regard it as doubtful that the president would have considered retaliating in this way.[106] Indeed, from the perspective of America's posture before the international community, the asymmetry of endangering aircrewmen's lives in combat to avenge a nonmilitary conspiracy that could be characterized as cowardly and immoral, was unlikely to enhance U.S. prestige. The deduction that an LRM strike was more a symmetrical form of retaliation was not especially complimentary to the TLAM, but perhaps indicative of the political logic which influenced the decision to strike.

In contrast to the June 1993 attack, the next set of diplomatic strikes, in September 1996, was overwhelmingly military in purpose. Between 1993 and 1996,

92

Saddam Hussein had massed ground troops on Kuwait's border in late 1994, prompting a compensatory deployment of US troops. In the summers of both 1995 and 1996, he had conducted additional troop movements in northern Iraq, including movement of aircraft in the northern NFZ, to counter the operations of Kurdish rebels (as well as the related activities of both official and insurgent elements from Turkey and Iran). By the first week of September 1996, Iraqi troops were deployed throughout northern Iraq and had not only fired on Kurdish villages but driven refugees from them. Iraqi fighters and SAMs, forbidden by the UN, were also present north of the thirty-sixth parallel.

On 3 and 4 September, the U.S. launched thirty-one TLAMs and thirteen CALCMs, primarily at IADS targets in southern Iraq. There was no question, based on President Clinton's official announcement, that the pretext for the strikes was Iraq's deployments to northern Iraq, which by then totaled 35,000 Republican Guard soldiers and over 300 tanks.[107] However, observers quickly pointed out that the targets struck had little direct correlation to troop disposition in the north. Moreover, the U.S. and U.K., concurrently with the missile strike, joined in unilaterally expanding the size of the southern NFZ, putting its northern limit 120 kilometers/70 statute miles closer to Baghdad.[108]

There were no TACAIR strikes performed in conjunction with the missile attack. For a second time, LRMs were used alone. Assuming that one of the objectives of the attack was indeed to deter Iraqi deployments in the north, the target selection indicates an indirect approach. Such an approach would envision coercing Saddam Hussein to relinquish his purpose in one place by threatening his war-making capability in another

93

place. From the overwhelmingly southerly orientation of the attack, and the concomitant expansion of the NFZ, it can be speculated that the U.S. believed it was attacking the forces which Saddam regarded as most vital to his long-term objectives. The analytical weight of two episodes of Iraqi force assembly against Kuwait, in 1990 and 1994, probably played a role in this assessment. Moreover, the allied effort against Iraq was focused in the south at this point: enforcement of the NFZ in the north had been suspended indefinitely in the spring of 1996, when Turkish troops deployed across the Iraqi border. Purely from the standpoint of facilitating allied air operations, there was little to be gained from striking Iraqi targets in the north, but clear operational advantage in degrading the IADS in the south.

The attack in September of 1996, Operation DESERT STRIKE, was politically problematic because of the disjunction between the stated purpose and the choice of targets. Defense Secretary William Perry addressed this issue at the time by pointing out that "Saddam Hussein has demonstrated once more his willingness to use military power recklessly, and [the U.S.] must demonstrate once more our willingness and capability to check that power and deter him from being the regional bully."[109] The missile strike, then, can potentially be assessed in terms of its strategic effects--deterring Saddam from being a regional bully, and more specifically, compelling him to remove his troops from northern Iraq--or in terms of its operational effects: specifically, reduction of the air defense threat to the coalition in southern Iraq.

The deterrence of bullyhood is typically assessed in the context of an agreed-on political perspective, which cannot be said to have existed in the U.S., or certainly among

her allies, in the two-plus years since DESERT STRIKE. If Saddam was deterred from being a bully, it was not for long, at least supposing bully to imply one who uses or threatens to use force where he has been told not to. Iraqi troops moved into northern Iraq again in 1997, also in response to incursions by Turkish and Iranian forces; and Iraqi aircraft violated both NFZs repeatedly in 1997, and late 1998 through early 1999. The year 1998 also saw the eviction of UN inspectors from Iraq, and the public assertion of former UN mission leaders that seven years of inspections and UN sanctions had not been effective in reducing Saddam's arsenal of weapons of mass destruction to a level which could be considered nonthreatening.

On the other hand, Saddam had been forced to withdraw forces from both NFZs in 1996. One report indicated that as many as 29,000 soldiers of the Republican Guard were moved out of northern Iraq after DESERT STRIKE. This still left 19,000 Iraqi troops there; and some analysts pointed out that although the troop withdrawal was probably accelerated by the missile strike, its timing was consistent with the continued use of Iraqi force to destroy the capabilities of the Iranian-backed Kurdish faction in the north. The troops were not, in fact, redeployed until after this had been accomplished.[110] A reported twenty-five Iraqi aircraft were also withdrawn from the southern NFZ-- specifically, aircraft which had been deployed at airfields between 32 and 33 degrees north. This withdrawal represented a less ambiguous example of compliance with coalition demands (which were not, it should recalled, UN demands, since the UN only recognized the NFZ boundary at 32 north). Since the U.S. and U.K., acting autonomously, had announced the new NFZ boundary in conjunction with the missile

attack, it is logically supportable to attribute Saddam's prompt compliance to the threat of additional strikes.

If the results of the missile strike were ambiguous from a strategic perspective, they could also be called so in an operational sense. While the attack did inflict damage on the Iraqi IADS, this apparently did not render Iraq unwilling to violate the southern NFZ repeatedly starting a year later. Blinding Saddam on his most exposed flank--the approach axis of coalition aircraft--did not have the definitive effect that a similar blinding was assessed to have had on the Bosnian Serbs a year before. The attack itself was also conducted with a high political cost: none of the Persian Gulf allies would permit the launching of TACAIR strikes from their territory to reinforce the missile strike, and the French withdrew altogether from further enforcement of no-fly zones in Iraq.[111]

In terms of LRM use models, DESERT STRIKE fits the model of attritional attack best. Once again, it facilitated no conventional maneuver. In size and scope, the attack was not designed to strike decisively at Iraq's national will. It did not seek to destroy a center of gravity; rather, as a strategic move, it was intended to inform Saddam that, in President Clinton's words, "If you abuse your own people, or threaten your neighbors, you must pay a price."[112] What is relevant to this thesis about such a message is that it implies an incremental approach. Extracting a price for each violation of UN resolutions is expected to be successful through iteration rather than intimidation at a single point in time.

More might have been expected of the strike at the operational level, given the apparent success of the DELIBERATE FORCE attack on the Bosnian Serb IADS the previous year. It is possible, although nowhere publicly stated, that military planners hoped to achieve with DESERT STRIKE the same undermining of national will that they assessed to have been the result of the Bosnian operation. If so, it may be said, first, that a result this decisive was not achieved. However, it is also true that, unlike in Bosnia, there was no negotiation process to which Saddam might be either wooed or coerced by the attack on his IADS. The framework did not exist for Iraq to express a change of national will through a specific public gesture.

Regardless of the exact intentions of the military strike planners, the operational effect of the strike was attritional. It degraded Saddam's IADS for a period of time. Since Iraqi aircraft did not routinely violate the southern NFZ either immediately before or immediately after DESERT STRIKE, the attack cannot be said to have had an observable effect on the enforcement of the NFZ per se; and again, it did not prevent Iraq from starting a series of daily NFZ violations slightly more than a year later. Thus, the operational effect of the strike was essentially to inflict some measurable, but not decisive, damage on a key Iraqi defense system.

The last strike considered in this thesis is the TLAM attack on terrorist support facilities in Sudan and Afghanistan in August 1998. The strike was prompted by bombings of the American embassies in Kenya and Tanzania, traced by U.S. intelligence to international terrorist Osama bin Laden, an exiled Saudi with a history of connection to high-profile attacks. On 20 August, U.S. warships launched seventy-nine TLAMs at the

97

terrorist targets: thirteen at a chemical plant in Khartoum, and sixty-six at a group of six targets in northern Afghanistan.[113]

Politically, this strike differed from the others which preceded it in two significant ways. One was that President Clinton did not choose to justify the strikes principally through rhetoric of his own. Unlike other strikes, this one was not accompanied by images of the President declaiming "Don't tread on us" and "Saddam must pay a price." Instead, his Secretary of State, Madeleine Albright, made the primary public impression with her assertion that "We will not be intimidated."[114] The President announced the strikes himself, but gave the political limelight to subordinates, including Secretary of Defense Cohen and JCS Chairman General Shelton, along with Albright.

The second difference in the 1998 strike was an unusual lack of information about it in the days immediately following the launches. One publication referred to the "deepening silence out of the Pentagon about the raids on Afghanistan and Sudan,"[115] and opined that the comparative dearth of publicity indicated that more strikes were being contemplated. National newsweeklies--*Newsweek, U.S. News, Aviation Week & Space Technology*--were in general agreement that Pentagon sources were unusually reticent about this strike; little was known beyond the number of missiles used, the targets struck, and the statement by National Security Advisor Sandy Berger that "moderate to heavy damage at each of the targets" had been inflicted.[116]

Since no further strikes were launched, the Administration apparently was not withholding information to avoid tipping its hand. The possible explanation that the President's advisors saw no value in unduly drawing attention to the President as a target

for terrorists would be expected to produce, from the same attitude, a sense that rhetoric was superfluous where force itself sent an unmistakable message. It is worth pointing out that the August 1998 strike--dubbed Operation INFINITE REACH--sent a variation on the messages of previous LRM strikes. Whereas the earlier strikes had reinforced the idea that the U.S. could hit its enemies' targets from a safe distance, the August strike highlighted the fact that the U.S. could find targets when it needed to, even unconventional targets without standard military features, which could only be identified through the analysis of multiple sources of sensitive intelligence.[117]

Administration claims lend credence to the idea that the President's low profile, and the comparative lack of publicity about the strikes, were related to concerns about terrorist retaliation. In the immediate aftermath of the missile strikes, White House officials indicated that they had evidence bin Laden was preparing to attack U.S. interests again. One official was quoted as saying, "You cannot overstate the imminence of what was about the happen."[118] Considering all aspects of the strikes, then, they probably had the dual purposes of informing bin Laden that his support bases were known to American intelligence and vulnerable to American missiles, as well as of deterring further terrorist attacks that were thought to be imminent.

What is noteworthy about the intentions and effects associated with the INFINITE REACH strikes is once again their incremental nature. Starting with the original analytical models of this thesis, it may be reiterated that the strikes were not conducted to facilitate maneuver. Nor were they meant to put a decisive end to bin Laden's operations. *U.S. News* summarized the following analysis by retired General J.H. Binford Peay:

"More important than destroying the assets of a bin Laden-style terrorist is sending the message that he will be struck repeatedly if his attacks continue . . . . "If we only get a 30 percent return [a low bombing success rate], that's OK, provided we hit him every time we have solid evidence he did something."[119]

Both the cautious public profile of the administration and the limited target set argue an incremental, attrition-based approach. The U.S. did not expect to terminate bin Laden's activities for good, but to curtail them and impress on him that such activities would not be without cost. It is important to enter one caveat here. A remarkably high number of missiles was used on the seven targets struck in INFINITE REACH,[120] which in light of the other factors analyzed here suggests that administration planners desired to maximize damage. Incrementalism in this case was manifested not in damage limitation, but in target selectiveness and limited objectives. If administration claims can be taken at face value, these limited objectives were met: damage was inflicted on some of bin Laden's support facilities, the message was conveyed that America could find and hit them, and imminent attacks by the bin Laden network on U.S. interests were forestalled.

The survey of diplomatic missile strikes between 1993 and 1998 thus reveals a common trend of attrition-oriented efforts. Some infliction of damage, which was recognized as less than decisive from a military standpoint, but nevertheless filled a perceived need in a specific situation, was all that decisionmakers sought. In the case of the Zaafaraniyah strike, a unique weapons capability was eliminated. This had no effect on national will, or Iraqi inclination to comply with UN demands; nor did it create any exploitable conditions or synergistic effects. It was simply attrition of an Iraqi capability.

100

The same could be said of the intelligence headquarters attack, although the attrition in this case was so slight as to be barely observable. The DESERT STRIKE attack likewise inflicted damage on the Iraqi IADS, but no subsequent effects of that damage on Iraqi behavior or determination can be identified. INFINITE REACH quite possibly deterred terrorist attacks being planned by the bin Laden organization, as reported by Clinton administration officials, and it certainly inflicted damage on the organization's support bases. But by the administration's own admission it was not intended to have a more decisive effect, and it did not.

There is one other facet of each of these operations which is common to all of them, and that is their isolation. None of them was a feature in a larger campaign. Each stood on its own as a U.S. operation with a specific objective or set of objectives. In this context, the choice of attritional effects as a desirable result is curious. Returning to the problem, introduced at the beginning of the chapter, of reconciling this use of military means as a continuation of political intercourse, the conclusion may be that it is the political objective itself that is incremental, or at least inconclusive except in the longest of runs. A military campaign intended to decisively achieve a political objective may be composed of attritional bombing as one of its elements, but attritional attacks that are neither sustained nor comprehensive nor intended to facilitate further exploitation by military means are a strange case indeed, meeting no criteria of military effectiveness. The import of this finding is summarized in the conclusions set forth in chapter 7.

CHAPTER 7

RECOMMENDATIONS AND CONCLUSIONS

The history of long-range missile employment summarized in this thesis is merely the first chapter in an unfolding era of warfare. Since the last LRM strike described in chapter 6 (August 1998), the U.S. has twice more resorted to LRMs for coercion, using them against Iraq in December 1998, and against the Federal Republic of Yugoslavia in March 1999. In each case, TLAMs and CALCMs were employed in an integrated air campaign designed to force a recalcitrant government to comply with U.S. demands. The use of LRMs in foreign interventions will undoubtedly continue, at the very least for political reasons; but for military professionals, the task remains to define the verifiable utility of these missiles in terms relevant to the military planner. Chapter 7 synthesizes the lessons gleaned from the studies undertaken in this thesis and advances a framework for historical assessment and future analysis.

The original question of this thesis was whether LRMs achieve the "complete and happy victory" defined by Belisarius as consisting in compelling an enemy to give up his purpose, while suffering the least amount of harm to one's own forces. The central thesis question was: Does the use of these missiles measurably improve their users' chances of compelling an enemy to give up his purpose while minimizing harm to themselves?

The subordinate questions expanded on this one by asking first, how is this improvement realized? Do the missiles exert a particular, missile-unique, compelling force in and of themselves, or do they improve the mechanism of military compulsion as one among several contributing factors?

Two fundamental interpretations of that question, as applied to warfare, were selected. One was General Bailey's view that compelling the enemy is achieved through maneuver, and that indirect fire--of which LRMs are a form as well as field artillery and airpower--is the twentieth century's revolutionary method of enabling maneuver with the least harm to one's own forces. The other interpretation was the one advanced originally by Giulio Douhet, and perfected through scientific analysis by the Friedmans: that is, that an enemy may in fact be compelled without maneuver, by the application of sufficient firepower; and that applying it from long range will ensure minimum harm to own forces.

A second subordinate question was, Is the contribution of LRMs uniform across the historical record of conflict, and at all levels of war? This question has been approached by analyzing LRM employment at the strategic, operational, and tactical levels, and comparing the conclusions drawn from each evaluation.

Finally, the thesis asked if long-range missiles can supplant higher-risk forms of engagement as a tool of war while achieving the same effect, or a better one? Conceptually, it was obvious that an analysis of LRMs in this framework would intersect with principles of war as defined in U.S. joint doctrine. The principle of *maneuver* is at the heart of the analysis, since from the perspective of indirect fire it is indispensable, but from the perspective of strategic-level intimidation it can be entirely obviated. The issue of minimizing harm to own forces is captured in the principle of *security*. A weapon which virtually guarantees *security* simply by being selected might imply a shift in the relative priority of principles of war in a commander's deliberations. LRMs would

clearly be expected to have an impact on the perception or emphasis of other principles of war as well, such as *unity of command* and *simplicity*.

In the context of the parameters established for analysis, the major conclusion of this thesis addresses the first two of its subordinate questions, and can be stated as follows: U.S. use of LRMs from 1991 to 1998 was focused neither primarily on facilitating maneuver, nor on intimidating the enemy directly or immediately, but rather on inflicting attritional damage in the style of a joint, integrated air campaign. This was most uniformly true of TLAM and CALCM use in both integrated (missile and TACAIR) and missile-only strikes. However, even ATACMS, which was used principally in a SEAD role to facilitate (air) maneuver in DESERT STORM, became the subject of a considerable effort to channel it into attritional use in writings by both Army and Air Force planners after the war.

This does not mean that LRM effects cannot be evaluated in terms of indirect fire or coercion through airpower. In DESERT STORM LRMs achieved traditional indirect fire effects, primarily on the air defense threats to Coalition tactical aircraft. LRMs directly facilitated the free movement of aircraft, and thereby indirectly facilitated the maneuver of ground troops. Similarly, in the particular circumstances of DELIBERATE FORCE in 1995, airpower achieved the objectives sought by NATO against the Bosnian Serbs, with the immediate catalyst for Serb capitulation being the TLAM strike which destroyed the Serbs' IADS in northwestern Bosnia.

However, the most prominent trend in LRM employment is their use to achieve attritional effects on opponents. This approach was part of a phased campaign in

104

DESERT STORM, and in the aftermath of that war has come to be the standard for joint

campaign planning. As highlighted in chapter 6, USACOM, the force trainer and

provider for the Department of Defense, encapsulates precisely this attritional method of

campaign prosecution in its TTP for joint task force training. As more and more joint

planners cycle through the exercises sponsored by USACOM, this phased, attritional

style of warfare is becoming an automatic preference of the mid-grade military

professional. It is perhaps not to be wondered at that the most celebrated weapons of the

decade have been employed primarily with this form of warfare, complete with its

attendant expectations, in mind.

It is an excellent question why, since the phased campaign-attrition approach was

set as a standard by DESERT STORM (and indeed was simply an outgrowth of applied

lessons from earlier wars), it has not been obvious that such an approach may explain the

employment of LRMs during and after DESERT STORM. Two reasons are most likely.

First, the perception of LRMs as a revolutionary class of weapon has encouraged analysts

to watch them closely for signs of apocalypse, and has simultaneously obscured more

prosaic evidence about them. This perception was a product of both the Cold War,

during which any missile was endowed with the cachet of a potential for strategic

intimidation, and the technological revolution which made precision guidance possible.

The second reason, however, is derived not from the assumptions of those who

contemplate missiles professionally, but rather from the nature of the ongoing debate in

the West over maneuver versus airpower. Proponents of one view tend to argue, with

General Bailey, that all applications of combat power ultimately serve maneuver, without

105

which no decisive military objective can be obtained. Proponents of airpower typically assume the converse position that airpower can sometimes, even if it does not always, achieve decisive military objectives without maneuver being involved. There is far more historical evidence for the first proposition than for the second, but neither is especially relevant to the applications of airpower, and of LRMs in particular, observed in the strikes and air campaigns conducted by the U.S. in the 1990s.

A central element is lacking in these strikes and campaigns, and that is the assumption, in their prosecution, that they will, at a projected point in time, have a specific, decisive result. As much as airpower proponents argue that airpower can be decisive, the intended results of air campaigns are nevertheless usually couched strictly in terms of damage to the enemy, rather than in terms of what the enemy will be compelled by that damage to do. This is most obviously true of the isolated TLAM and CALCM strikes conducted between 1993 and 1998, when the stated objective was typically to make opponents pay a price or recognize consequences. Even the actual effects of the strikes were measurable only in terms of what damage was done to the targets. Coercion of the opponent to do or not do a specific thing might have been a stated goal, but the target selection was seldom optimized to achieve that goal.

Even in DESERT STORM, the attritional use of TLAMs against Iraqi national political targets was expected to have no more than an incremental effect. One may deduce from the design of the campaign, as described in chapter 4, that planners hoped TLAMs would have a decisive effect when used on political targets, but assumed that they probably would not. The phases of the campaign were intended to intensify damage

sequentially, apparently on the premise that the attrition envisioned in the first few days, while both serious and focused, would probably not be adequate to compel Saddam.

What is notable about this attitude toward attrition, aside from the fact that it seems to be an existing condition which is not explained adequately in theoretical writings about airpower, is that it focuses on attrition as an end in itself, rather than as a means to create conditions exploitable for an articulated purpose. This can be seen at two levels in the LRM examples. In DESERT STORM, planners hoped that widespread damage to his command infrastructure would compel Saddam to give up his purpose, but their campaign did not specify methods of exploiting the damage inflicted on Iraqi targets to achieve this. It was tacitly assumed, in the design of the campaign, that the destruction wrought on Baghdad would not create the Douhetan effect on morale sought by the most avid proponents of airpower; but the logical consequence of this assumption was not pursued--that is, that destruction, if it was to achieve the purpose of compelling Saddam, would have to be followed up with specific forms of exploitation.

Likewise, in the diplomatic LRM strikes, targets were not selected with a vision of exploiting their destruction in pursuit of the stated objectives. This was particularly clear in the 1996 DESERT STRIKE attack, when allied exploitation of damage to the IADS in southern Iraq would have had little relevance to the primary stated objective of forcing Saddam to withdraw his forces from northern Iraq. Even from the perspective of enforcing the southern no-fly zone, it must be noted that the coalition did not, in fact, exploit the increased vulnerability of Baghdad which resulted from the dismantling of its IADS to the south.

The same principle can be identified at work in the other diplomatic strikes as well. The loss of the Zaafaraniyah facility in January 1993 was essentially attrition of Saddam's capabilities which did not result in any type of follow-on exploitation by the U.S. The same may be said of the Iraqi intelligence headquarters. And although less information has been made available about the strikes on Sudan and Afghanistan in 1998, the Clinton administration's own public justification of the attack focused principally on the political rebuke of the bin Laden organization, rather than on articulation of a national campaign to restrain terrorism. Damage for damage's sake, rather than as a vehicle for obtaining specific advantage, was the principle at work in each of these strikes.

It should be noted that this principle is not at odds with the methodology of joint campaigns as envisioned in extant tactics, techniques, and procedures doctrine (TTPs). Ideas about campaign planning are disjointed at precisely the point where the destruction inflicted by an air campaign must be translated into an exploitable condition for the joint force. As indicated in chapter 4, the objective of an air campaign is typically stated to be air superiority, with the measures of effectiveness being the amount of attrition inflicted on an array of the enemy's combat power elements (for instance, IADS components, fuel facilities, and operational aircraft). However, the campaign concept does not normally envision air superiority, in and of itself, as being capable of compelling the enemy in a decisive manner. Nor does it suppose that the loss of any particular enemy system destroyed by airpower--such as national-level C2--will create a condition exploitable by specific follow-on action. Instead, the concept on which the entire campaign hinges is the

idea that widespread destruction will make the opponent less capable, in general, of fighting back.

It is somewhat ironic that LRMs, often considered the very definition of front-line RMA weaponry, should highlight the continuing dependence of U.S. joint campaign formulation on the industrial age solutions of firepower and mass effects. It may even be postulated that the favor LRMs enjoy with the NCA is evidence that the tendency to prefer relentless destruction over intelligent exploitation of specific advantages was not confined to World War I. By enabling decisionmakers to attack enemy targets with impunity, LRMs lower the cost of inflicting destruction, and thereby reduce the comparative value of exploiting destruction as an alternative to simply inflicting more of it.

General Bailey articulated this concept perfectly in the context of the battlefield. The method for exploiting destruction, in the World War I model he developed, was simply maneuver. Indirect fire created conditions which could be exploited by maneuver, and thus, in Bailey's view, revolutionized warfare. The intolerable condition which demanded this operational solution was that of relentless destruction inflicted through direct fire by both sides, unrelieved by any exploitation of tactical advantages. Certainly direct-fire planners had standards for what to target with their weapons to produce the greatest damage to the enemy, just as modern air campaign planners have long, thoughtfully assembled target lists and a growing body of targeting doctrine. What military thinkers lacked at the outset of World War I, however, was a conceptual framework for exploitation at the point where an advantage was created.

It can be argued that this conceptual framework is exactly what modern U.S. doctrine for campaign planning lacks. The value of Bailey's model to the current situation is lessened somewhat by his exclusive focus on traditional, geographic ground maneuver as the vehicle for exploiting advantages; but the fundamental principle is remarkably enduring. World War I proved that firepower and destruction which were not exploited tactically became repetitive and predictable, and desensitized the opponent to their attritional effects. Of particular relevance to military planning, firepower which was not intended to be exploited in a specific way--a category virtually all direct fire fell into--achieved stalemate at best. However, firepower which sought to create specific, immediately exploitable conditions--indirect fire followed by maneuver--achieved advantage, breakthrough, and seizure of territory.

This perspective on using firepower to create exploitable conditions is captured in the traditional sense in the joint doctrine principle of *maneuver*. However, as demonstrated in chapters 5 and 6, conventional maneuver--that is, physical movement in relation to the enemy--frequently has little relevance to LRMs in terms of exploiting advantages created by them. One may accept the apparent assumption of attritional warfare that the need to maneuver, in the sense of preparing to exploit advantages rapidly, is not universal for successful combat; but that conclusion is disputed by both historical experience and U.S. doctrine. What may be more valuable is to recognize that LRMs present commanders with tools for creating conditions exploitable by means other than conventional maneuver.

One means of approaching this idea is to redefine the *maneuver* principle of war. Two recent attempts to do that have particular relevance for the inquiry of this thesis. Both attempts are predicated on the changing nature of war posited by the common interpretation of the current RMA, as a phenomenon of both technology and the broadening of the spectrum of military operations.

Russell Glenn, in an article for *Parameters* in 1998, focuses on the broadened spectrum of operations in approaching the redefinition of principles of war. He proposes the rubric of principles of "not only war" and makes the conceptual leap from this to simply principles of operations. Within this framework he arrives at a new principle of *exploitation*, which cannot fail to interest a student of long-range missiles at this point. The concept of *exploitation* is predicated on the assertion that "Success . . . may prove transitory if not seized upon quickly. The military must set the conditions for exploiting success . . . . Exploitation . . . pertains to capitalizing on all successes, and planning to do so even before achievement of success . . . . The cumulative effects of multiple sequential or simultaneous successes are . . . seldom wargamed."[121]

Glenn conceives of combat success--as opposed to success in operations other than war--as primarily achieved through and exploited by conventional maneuver, largely because his focus is on Army operations. But his framework is general enough to apply to combat success achieved through attrition by airpower. The contribution of his formulation is that it demands that attritional success be defined by planners, beforehand, in terms of the specific, exploitable advantage it ought to produce, rather than in terms of a level of destruction.

A second effort to revise the joint principles of war was undertaken by writers at the Army War College's Strategic Studies Institute (SSI) in 1995.[122] The SSI monograph approached the principles of war from a strategic perspective, and concluded that *maneuver*, as a form of exploiting advantages and disadvantages, would be better expressed as *orchestration*, and should specifically encompass all national instruments of power--political, informational, and economic, as well as military. Conventional maneuver would still be a subset of *orchestration*, but the SSI authors assert that, "While orchestration is dynamic in nature, it does not always require motion."[123] What it does require is precisely the same thing Glenn requires of *exploitation*: advance planning. In their view, "strategists must develop concepts that permit not only dynamic, but also flexible execution. Thus, plans must include branches and sequels that permit agile responses . . . ."[124]

Planning to capitalize on the advantages associated with specific branches and sequels of a campaign plan is the element lacking in the attritional model of warfare by which most LRM employment has been guided. This attritional model instead relies on achieving a general level of destruction which need not produce any specifically exploitable conditions. Revealing this aspect of LRM attacks may explain both why they were designed as they were by military planners and why they have demonstrated little ability to produce direct, attributable effects on their victims.

The one exception to this rule is the DELIBERATE FORCE TLAM strike. It tends to prove the rule, however, because it was the one LRM strike intended to create a specific exploitable condition: a dramatically heightened fear in the Bosnian Serbs that

they were completely vulnerable to NATO airpower. The strike, which destroyed the Serbs' IADS in northwest Bosnia in the short space of fifteen minutes, was planned to benefit from abruptness and surprise, and was also orchestrated to punctuate General Janvier's departure from a failed attempt at negotiation. It thus achieved a doubly-impressive psychological effect, particularly on the heels of almost two weeks of bombardment. The extended air campaign had the attritional motive in this case; the LRM strike, on the other hand, was designed for exploitation. Of all the LRM attacks considered here, it was the one which achieved an identifiable campaign objective.

The major lessons from this thesis about LRMs are intertwined: first, that their employment has primarily been as a tool of attrition; and second, that this fact highlights a need to improve the definition of a key principle of war, *maneuver*. In its traditional form, *maneuver* is not relevant enough to airpower in general, and to LRM use in particular, to overcome the attrition-oriented mind-set of joint campaign planners. However, the final argument of this thesis is that the demonstrated focus on attrition must be overcome, both as a matter of intelligent LRM employment, and more generally as an issue for effective campaign planning. This ultimate argument relates directly to the central thesis question: Does the use of LRMs measurably improve their users' chances of compelling an enemy to give up his purpose while minimizing harm to themselves? Based on the thesis survey, the answer must be a qualified no. Harm may be invariably minimized by using LRMs, but using them does not tend to improve the chances of compelling the enemy to give up his purpose. However, since the attritional method of employing LRMs places an external limitation on their operational effectiveness, it

cannot be conclusively determined that LRMs will not produce a compelling effect on an enemy if used in a different way. They have shown however, that they will not produce a compelling effect when used attritionally.

The overall inefficacy of the attritional approach can be argued from the perspective of the trench-warfare stalemate which was attrition's infliction on World War I. But a more recent example is available. The LRM strikes studied here, in which simple attrition was favored over the focused creation of specifically exploitable conditions, are in several ways reminiscent of the bombing campaigns conducted in Vietnam during the Johnson administration.

If there is one thing on which a substantial number of military commentators on the Vietnam conflict agree, it is that the aerial bombardment of Vietnam was conducted in a manner entirely focused on incremental attrition.[125] The air campaign failed specifically to attack targets which would create exploitable conditions advantageous to the U.S. and South Vietnam. Instead, by design, it emphasized damage to targets as an end in itself, designed to communicate the firmness of U.S. intention to North Vietnam. The air campaign even actively avoided attacking targets whose destruction was predicted to yield too much advantage to the U.S., and thereby potentially alarm China or the Soviet Union. Although the air campaign's targets were proposed by the military commanders, target sets were approved for attack only by the NCA, and were restricted to militarily insignificant targets[126]--in effect, those which promised no advantage to the U.S. by their destruction--for the first five years of the war.

114

It should be noted that the rationale for the "graduated pressure" concept behind the Rolling Thunder air campaigns in Vietnam differed from the rationale for 1990s diplomatic strikes in one significant respect. Whereas the diplomatic strikes, for the most part, targeted facilities with capabilities significant to the opponents, for the purpose of destroying those capabilities, the Rolling Thunder campaign was intended merely to "convey American resolve and thereby convince [the] adversary to alter his behavior."[127] Indeed, State Department official Walt Rostow "argued that air power only had to coerce Hanoi's leaders to stop supporting the insurgency [in the South] rather than destroying their ability to do so."[128] The similarity between the Vietnam air campaign and the 1990s diplomatic strikes thus lies not in an identical approach to intimidation, but in their similar lack of focus on achieving specific attritional goals as conditions for follow-on exploitation. In essence, both types of campaign relied on attrition--for different reasons--but neither made preparations to exploit it.

The conclusions of this thesis imply that one useful perspective on any air campaign is its ability to create for its architect an exploitable advantage. Interestingly, this implication is highlighted by the historical failure of the diplomatic LRM strikes to do exactly that. The DELIBERATE FORCE TLAM strike appears to have achieved this objective as part of a multiweek bombing campaign, and the effects of both TLAM and ATACMS in DESERT STORM produced exploitable advantage at the tactical level of war. However, LRM strikes, by themselves, even when they achieved a measurable amount of attrition against enemy targets, have not been distinguished by the production of exploitable advantages.

The presence, in U.S. doctrine, of an attritional approach to air campaign targeting which is not oriented on creating exploitable advantages, may partially explain this phenomenon. As the work of both Glenn and the SSI authors suggests, perhaps the most significant systemic shortfall in U.S. military thinking, as it relates to the attritional effect of LRM strikes, is the absence of advance planning for exploiting advantages. If neither the air planners nor the joint campaign planners build *exploitation* into their overall concept, it is not surprising that advantages may go unexploited, and may not even be anticipated in the first place.

Although the attritional model of warfare emerging from this thesis is a separate category from the models of indirect fire and intimidation proposed in chapter 2, it is instructive to compare attrition with the other two. General Bailey's formulation of indirect fire links it indispensably with maneuver, insisting on an ironclad necessity to exploit the advantage produced by indirect fire with maneuver forces. The Douhetan model of intimidation through airpower, on the other hand, implies even in its more modern incarnations that little if any exploitation is required to reap the rewards of strategic bombardment. The enemy will capitulate because he perceives his disadvantage (or our advantage) in the same way we do, regardless of our energy or specific actions in exploiting it. Compared in these terms, the indirect fire-maneuver model actually amounts to an exploitation model--and has the merit of fitting more incidents of successfully compelling an enemy to give up his purpose than the intimidation model. The intimidation model is, in effect, a nonexploitation model, since its premise is that no

exploitation is actually required to compel the enemy; the damage itself, whether focused or merely widespread, is enough.

To the extent that the attritional approach evident in the diplomatic LRM strikes is a nonexploitation approach, it can perhaps be expected to fail as Douhetan intimidation generally has when employed in isolation. The lesson that LRM use has been primarily attritional in terms of its operational effectiveness suggests that attrition itself is a tool that U.S. doctrine could employ more effectively. The concept of exploitation, or capitalizing on the advantages produced by military action, has specific relevance for attrition in this context. If the conclusions of this thesis suggest one line of further inquiry, it would be a historical investigation of direct links between the attritional use of airpower against enemy capabilities, and the follow-on exploitation of the resulting damage as a planned element of campaigns--or lack thereof. Fully investigating this connection might shed light on the enduring idea, fundamental to the modern interpretation of Belisarius' complete and happy victory, that inflicting damage through airpower can compel an enemy with little or no inconvenience to own forces. In serving to highlight the lack in U.S. doctrine of a conceptual scheme for exploiting advantages, this investigation of LRMs has perhaps produced its most beneficial effect.

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[1]George Friedman and Meredith Friedman, *The Future of War* (New York: Crown Publishers, 1996), 22.

[2]The concepts of strategy and grand strategy are used in this paper in accordance with the definitions of B.H. Liddell Hart in *Strategy*, 2nd rev. ed. (New York: Signet, 1967). His definitions, formulated between pp. 319 and 323, can be summarized as follows:

Grand strategy: the execution of national policy, which includes but is not limited to going to war. Grand strategy coordinates and directs all the resources of a

nation toward attainment of its goal. It is distinguished by having a moral element--such as the will of the people, a just cause, or ethical means--and it looks beyond the war to the subsequent peace.

Strategy: "the art of the general." Subordinate to grand strategy, which chooses its ultimate goal, strategy is concerned with the use of means--planning, resources, and the principles of war--to achieve the military objectives that will attain the goal. Liddell Hart quotes Moltke's definition of strategy: "the practical adaptation of the means placed at a general's disposal to the attainment of the object in view."

[3]Quoted in Liddell Hart, *Strategy*, xii.

[4]Michael J. Mazarr, *The Revolution in Military Affairs: A Framework for Defense Planning* (Carlyle, PA: U.S. Army War College Strategic Studies Institute, 1994), 2.

[5]Mazarr, 17-18. Mazarr refers to this phenomenon as a whole--in which information-based weaponry reduces risk to own forces by enabling them to impose effects on an enemy at greater distances--as "disengaged combat."

[6]The terms industrial age and information age are used in this paper to coincide roughly with the civilization waves postulated by Alvin and Heidi Toffler in *War and Anti-War: Survival at the Dawn of the 21st Century* (New York: Little, Brown & Co., 1993). In their formulation, the industrial age equated to their Second Wave civilization and was characterized by capital-based, mass production-oriented methods of organizing economies, nation-states, and warfare. The information age corresponds to the Third Wave civilization of the present, and is predicated on the decentralization of states, international markets, and warmaking organizations. Both the methods of production and the coinage of exchange and conflict in this civilization have shifted from centralization and material goods to less organized forms of information and influence.

[7]James F. Dunnigan captures a broad spectrum of skeptical views in his *Digital Soldiers: The Evolution of High-Tech Weaponry and Tomorrow's Brave New Battlefield* (New York: St. Martin's Press, 1996). Of information warfare he says, "Basically, it's a marketing scam" (265); but he concludes that precision-guided missiles, being "smarter, reliable, and more lethal" (198)--as well as cheaper--are slowly taking over the presumably indispensable functions of manned bombers in modern war.

[8]See especially LT Timothy F. Sparks' thesis, "The Dawn of Cruise Missile Diplomacy" (Master's thesis, Naval Postgraduate School, 1997), which provides numerous references to descriptions of the Tomahawk cruise missile as the "weapon of choice," in the public statements of U.S. National Command Authorities as well as military thinkers, politicians, and defense industry editorialists.

[9] This thesis uses the nine joint principles of war listed in U.S. Joint Chiefs of Staff, Joint Publication (Joint Pub) 3-0, *Doctrine of Joint Operations* (Washington, D.C.: Joint Chiefs of Staff, 1995), A-1 to A-3. See glossary.

[10] As defined by Charles Dunlap, Jr., in an essay for the Army War College, asymmetrical warfare "in the modern context . . . emphasizes what are popularly perceived as unconventional or non-traditional methodologies." See his "Preliminary Observations: Asymmetrical Warfare and the Western Mindset" in Lloyd J. Matthews, ed., *Challenging the United States Symmetrically and Asymmetrically: Can America be Defeated?* (Carlisle, PA: U.S. Army War College Strategic Studies Institute, 1998), 1. It is not the argument of this thesis that long-range missiles constitute an asymmetrical approach to warfare. These missiles are used to target combat power by attacking enemy formations, military equipment, or vital infrastructure. At the national strategic level they may constitute an asymmetrical method from a *diplomatic* perspective, if they are used to attack military or unconventional weapons infrastructure outside the context of a traditional war. But in the context of military operations, they are, for the purposes of this thesis, a symmetrical form of combat power. Their advantage is not in their asymmetry but in their relative effectiveness compared to their relative risk.

[11] Of note, the common characteristics and influences of the missiles considered in this thesis have not often been recognized in the literature. Missiles are typically categorized as either cruise or ballistic; as either tactical or strategic (i.e., intercontinental); as subsonic or supersonic, etc. These categories are useful from the standpoint of countermeasures and simple threat-range calculation, but have less value for analyzing operational missile employment. One of the very few efforts to assess missiles in light of their effects, as opposed to their propulsion method or absolute range, is LTC William C. Story's "Third World Traps and Pitfalls: Ballistic Missiles, Cruise Missiles, and Land-Based Airpower" (Master's thesis, USAF School of Advanced Airpower Studies, 1996).

[12] Although not considered in the employment analysis of this thesis, it is worth noting that other countries have developed LRMs that are currently in operation, including the former-Soviet SS-N-21 sea-launched land-attack cruise missile and AS-15 KENT air-launched land attack cruise missile; the French Super Apache land-attack cruise missile; and the Swedish autonomous stand-off missile (ASOW), modified from the RBS-15 surface-to-surface missile. The range extension of the Russian SCUD-C, along with precision guidance updates (primarily the incorporation of GPS-based guidance), represents an effort to improve the SCUD to the level of ATACMS. See Ben Sheppard, "Ballistic Missile Proliferation and the Geopolitcs of Terror," *Jane's Intelligence Review*, December 1998, 40-44; David A. Fulghum, "Cheap Cruise Missiles a Potent New Threat," *Aviation Week & Space Technology*, 6 September 1993, 54-55; and "Luna-M: A Source of Third World Thunder," *Jane's Intelligence Review*, June 1996, 249-253.

[13]Citing examples of this premise would involve listing virtually every work in the thesis bibliography. There is no doubt of the professional opinion that operating from outside an opponent's circle of comparable lethality reduces the risk to own forces considerably.

[14]References for these respective arguments are found in the notes to chapter 2.

[15] The term maneuver is used in two ways in the thesis. When it appears in italics, it refers to the joint principle of war, *maneuver*. When it appears unitalicized it refers to maneuver as an element of combat power which is usually specific to a combat context, such as ground maneuver, air maneuver, or the identification of maneuver forces in a particular situation. As a combat element, maneuver involves movement, whereas when it is discussed as a principle of war, *maneuver* emphasizes advantage. Advantage is often, but not always, derived from movement; it is a primary concern of this thesis to determine whether there is evidence that LRM use produces advantage only in combination with maneuver (movement), or if it can produce advantage without maneuver. For discussion of maneuver as an element of combat power, see U.S. Army, Field Manual (FM) 100-5, *Operations* (Washington, D.C.: Department of the Army, 14 June 1993), 2-13.

[16]All joint pub citations are from U.S. Joint Chiefs of Staff, *Joint Electronic Library*, prepared by OC Incorporated in cooperation with J-7, the Joint Staff [CD-ROM] (Washington, D.C., 1998).

[17]Web server available from http://www.fas.org ; Internet; accessed on 10 April 1999.

[18]Pape's *Bombing to Win* typifies both the airpower studies, and the focus of missile studies on the coercive potential of widespread destruction.

[19]See endnotes on Betts' *Cruise Missiles* and Werrell's *The Evolution of the Cruise Missile* below.

[20]The DESERT STORM study does include a category of inquiry called "Air campaign effectiveness in achieving strategic objectives," but looks at the stated objectives of the air campaign itself, such as air supremacy and destruction of Iraq's SCUD missile capability, rather than at their implications for the overall national goal--in this case, the defeat of the Iraqi Army through maneuver by the Coalition ground force. This is to be expected in a civilian study focused on weapon system effectiveness. Notably, this GAO study also points out that even the simple desire to attribute target effects to particular weapons is difficult, and often impossible, given the limitation of battle damage assessment (BDA) when multiple weapons have been used to attack a single target. See U.S. General Accounting Office, *Operation DESERT STORM: Evaluation of the Air Campaign* (Washington, D.C.: U.S. GAO, 1997), 111-112 and

148-152. While this is a compelling question for purposes of both military targeting and weapons procurement, its emphasis is misdirected for this thesis, which seeks to understand not which weapons the U.S. should buy more of, or use on particular types of targets, but whether long-range missiles have distinctive advantages for a military campaign.

[21]U.S. General Accounting Office, *Cruise Missiles: Proven Capability Should Affect Aircraft and Force Structure Requirements* (Washington, D.C.: U.S. GAO, 1995), 33. Hereafter cited as the GAO 1995 Report.

[22]Michael MccGwire, "The Tomahawk and General Purpose Naval Forces," in *Cruise Missiles: Technology, Strategy, Politics*, ed. Richard K. Betts (Washington, D.C.: The Brookings Institution, 1981), 233.

[23]The TLAM's penetration of world consciousness is similar to that of iconic figures like Princess Diana. The author's own experience in rural *soukhs* in the Middle East and North Africa is illustrative. The teenage runners who are employed there to attract customers with encouraging patter tailor their remarks to the perceived nationality of a tourist. Hearing runners call, "Hey, American! Chicago Bulls! Tomahawk missile! Very good!" is an experience which leaves no doubt as to the universal recognition of the TLAM.

[24]Richard K. Betts, "Innovation, Assessment, and Decision," in *Cruise Missiles*, 1.

[25]"Operational" is used in two basic senses in this thesis. Here it refers to the idea of methods of applying force to achieve objectives. This usage mirrors the definition of "operational effectiveness" provided in chapter 1, but does not refer to the operational level of war. "Operational," which Webster's defines most basically as "related to the doing or performing of a practical work," is a difficult term to avoid in military writing. In this thesis it either refers to the operational level of war, which will be made clear in the context, or it refers to an aspect of "operational art," which focuses essentially on attaining objectives. The word functional may be used here interchangeably with operational in this sense, but only to relieve monotony or confusion in the text. With respect to the advantages LRMs may provide for attaining objectives through military means, operational is a better adjective.

[26]The Soviets, for example, argued that cruise missiles were problematic for verification because tactical and strategic airframes were identical; and that the difficulty of detecting them in flight created an insuperable obstacle to the continued reliance of the superpowers on mutual assured destruction for deterrence. See Raymond L. Garthoff, "Soviet Perspectives," in *Cruise Missiles*, ed. Betts, 342-354; and Betts, "Complexities, Uncertainties, and Dilemmas," in *Cruise Missiles*, 541-546.

[27]Giulio Douhet, *Command of the Air* (New York: Coward-McCann, 1942), 47-48, quoted in Robert A. Pape, *Bombing to Win* (Ithaca: Cornell University Press, 1996), 60.

[28]See Story, "Third World Traps and Pitfalls," for a well-documented summary of German intentions in developing the "V" missiles.

[29]Jonathan Bailey, *The First World War and the Birth of the Modern Style of Warfare*, Occasional Number 22 (London: The Strategic and Combat Studies Institute, 1996). This occasional paper has been reproduced in part in *Field Artillery* magazine, with part I appearing in the September-October 1998 issue.

[30]Bailey, 17-18.

[31]Bailey, 18.

[32]Bailey, 6.

[33]T. R. Fehrenbach, *This Kind of War*, quoted in U.S. Army Command and General Staff College, *CGSOC Preparatory Course (P920)* (Leavenworth, KS, CGSC, April 1998), 53.

[34]An example of this, offered by Friedman and Friedman, is the counterintuitive product of science called radar, an invisible sentry which on its introduction eliminated virtually all the claims to stealth of airborne vehicles, and prompted a cycle of expensive protection for aircraft that still costs major air powers billions of dollars a year.

[35]Bailey places the development of indirect-fire methodology in the same years--the three decades prior to World War I--in which the philosophical basis for the Friedmans' scientific revolution of warfare was formed. See Bailey, 7-11, and Friedman and Friedman's references: Solly Zuckerman, *Scientists and War: The Impact of Science on Military and Civil Affairs* (New York: Harper & Row, 1967), 8-20; and David E. Fisher, *A Race on the Edge of Time: Radar--the Decisive Weapon of WWII* (New York: McGraw-Hill, 1988), especially chapters 1 and 2. See also Merrill I. Skolnik, *Introduction to Radar Systems* (New York: McGraw-Hill, 1980), 8-12.

[36]Bailey, 11 and 19-20.

[37]Friedman and Friedman, 159.

[38]Both terms, coercion and intimidation, have a distinguished history in professional writing on the subject of compelling the enemy to give up his purpose or do one's will. In this thesis, coercion will be used to signify compelling the enemy at the operational level of war, while intimidation will signify compelling him at the strategic level of war.

[39]Such assertions were especially common in the immediate aftermath of DELIBERATE FORCE. See LTC Robert C. Owen, "The Balkans Air Campaign Study," Parts 1 and 2, in *Airpower Journal*, Summer and Fall 1997, 6-26; and John A. Tirpak, "Deliberate Force," in *Air Force Magazine*, October 1997 [magazine on-line]; available from http://www.afa.org/magazine/1097deli.html; Internet; accessed 03 January 1999.

[40]"Strategic attack" is not doctrinally defined by Conversino, precisely because he believes it requires reappraisal; but the category of attack he means to address equates to deep interdiction. It may include taking out air defense C2--an operational military target --or fuel facilities for an enemy army; or even electrical power distribution for a segment of the civilian population. Strategic attack as used by Conversino does not, however, encompass close air support, or air attack short of the fire support coordination line.

[41]Described in Pape, 60-63.

[42]Principles of war were drawn from U.S. Joint Chiefs of Staff Joint Publication (Joint Pub) 3-0, *Doctrine of Joint Operations* (Washington, D.C.: Joint Chiefs of Staff, 1995), A-1 to A-3. For simplicity, the joint definitions of principles of war are used in this thesis rather than the definitions of any single service.

[43]The characteristic animus against air attack for strategic purposes was captured somewhat comically in a singularly vituperative volume entitled *Disaster Through Air Power*, by Marshall Andrews (New York: Rhinehart & Co., Inc.), published in 1950. "Strategic air power," Andrews asserted, "demonstrated itself [in WWII] to be an incredibly expensive method of achieving indecisive results." (6-7) He accused the Army of "permit[ting] itself to be relegated to a secondary role in war, as guards for Air Force bases and an 'occupation force' following air power victory," and of "destroy[ing] the aggressive spirit absolutely vital in land warfare." (11) Andrews insisted that defense policy would someday "toss [young Army officers] into the holocaust of ground combat spiritually, physically and militarily unprepared to survive their ordeal" (11); and he employed suggestive chapter headings like "Unmilitary Doctrine," "Stepchild of Air Power," and "Bid for Empire," in case his opinion was not sufficiently clear. Noted historian S. L. A. Marshall's willingness to pen the introduction to a book that characterizes U. S. airmen as "the new barbarians" (143) may suggest how calmly extreme opinion can be accommodated in the mainstream of the century-old debate over air attack versus ground force attack. A great virtue of Jonathan Bailey's theory of modern warfare is that he reconciles these competing elements of combat in the traditional language of the army as indirect fire and maneuver.

[44]Joint Pub 3-0, A-1

[45]Philip O. White, "The Role of the Army Tactical Missile System in Joint Warfare" (Unpublished paper, U.S. Army War College, 1993), 4-5.

123

[46]White, 7; U.S. Army Command and General Staff College, *CGSOC Preparatory Course P920*, excerpt from BG Robert H. Scales, Jr., *Certain Victory: United States Army in the Gulf War* (Leavenworth, KS: Army Command and General Staff College, April 1998), 72-74.

[47]White, 7.

[48]Ibid.

[49]Fire support coordination line is defined as "a line established by the appropriate land or amphibious force commander to ensure coordination of fire not under the commander's control but which may affect current tactical operations. The fire support coordination line is used to coordinate fires of air, ground, or sea weapon systems using any type of ammunition against surface targets." Joint Pub 1-02, 181.

[50]White, 10-12. White refers to a 1992 "Attack Operations Study" performed by the Army Field Artillery School in Fort Sill, OK, which concluded that the firing responsiveness of ATACMS to short-notice tasking made it ideal for the time-sensitive requirements of SCUD hunting. White and others (note 6) point out that the ATACMS Extended Range, GPS-equipped variant (now Block IIA) can be precision-targeted within minutes on a SCUD launcher up to 300 kilometers (180 statute miles) away.

[51]See discussions in White; Leonard S. Moskal, "The Role of ATACMS in JFACC Planned Deep Operations" (Unpublished paper, U.S. Army Command and General Staff College School of Advanced Military Studies, 1996); and Mark J. Eshelman, "Air Commander Control of U.S. Army Deep Fire Assets" (Unpublished paper, U.S. Army Command and General Staff College School of Advanced Military Studies, 1993).

[52]The Joint Pub 3-0 definition of *maneuver* is service-independent, and easily accommodates application to an air as opposed to a ground force. It should be observed, however, that using the term maneuver in the context of an air force decouples it from the terrain orientation that renders it specifically meaningful as a principle of war.

[53]White, 8-10.

[54]Byron E. Greenwald, *SCUD Alert! The History, Development and Military Significance of Ballistic Missiles on Tactical Operations*, The Land Warfare Papers, Number 22 (Arlington, VA: Association of the United States Army Institute of Land Warfare, 1995), 3-4.

[55]Story, 26-28.

[56]Pape, *Bombing to Win*, chapter 3.

[57]The Army's argument for ATACMS is paralleled by an Air Force and Navy effort to incorporate quicker-response precision into the Joint Stand-Off Weapon (JSOW) system; and the Navy's program to reduce response time of two precision weapons to near-real-time targeting inputs: TLAM and the Stand-Off Land Attack Missile-Extended Range (SLAM-ER). See Mark Hewish, "Scudkillers: Tough Choices for Boost-Phase Intercept," *Jane's International Defence Review*, January 1996, 28-33; David A. Fulghum, "Army Eyes Development of Small Cruise Missile," *Aviation Week & Space Technology*, 16 September 1996, 28-30; and David A. Fulghum, "Sub-Based Missile Tracks Mobile Scuds," *Aviation Week & Space Technology*, 13 January 1997, 369.

[58]Jeffrey Richelson, "The Dilemmas of Counterpower Targeting," in Desmond Ball and Jeffrey Richelson, eds., *Strategic Nuclear Targeting* (Ithaca, NY: Cornell University Press, 1986), 163-64.

[59]United States General Accounting Office, *Operation DESERT STORM: Evaluation of the Air Campaign* (Washington, D.C.: U.S. GAO, 1997), 194. Hereafter cited as GAO 1997 Report. The original four objectives stated by President Bush in his address to Congress on 5 August 1990 were: (1) effect the immediate, complete, and unconditional withdrawal of all Iraqi forces from Kuwait; (2) restore Kuwait's legitimate government; (3) ensure the security and stability of Saudi Arabia and other Persian Gulf nations; and (4) ensure the safety of American citizens abroad. The objective of destroying Iraq's war-making capability was added during the DESERT SHIELD buildup.

[60]Joint Pub 3-0, A-3.

[61]The Soviet missile system prompting development of a long-range missile capability was the SS-N-12 SANDBOX cruise missile carried by forward-deployed submarines and cruisers of the Red Banner Fleet in the 1970s. The SS-N-12 was a highly superior successor to the Soviet STYX series (SS-N-2) naval cruise missile, which had startled the U.S. Navy with its effectiveness against an Israeli warship when use by the Egyptians in the 1967 war, and so generated the requirement that resulted in the Harpoon antiship missile. The range of the SS-N-12's original variant, 150kilometers, was greater than the range of any U.S. antiship missile ever developed, except for the TASM, and was ultimately doubled in the SS-N-12's follow-on, the SS-N-19 SHIPWRECK, which remains in service with the Russian Navy today.

[62]See Kenneth P. Werrell, *The Evolution of the Cruise Missile* (Maxwell Air Force Base, AL: Air University Press, 1985), 150-155, for a useful--and entertaining--summary of the convoluted ancestry of the Tomahawk.

[63]Technologically, cruise missiles are more difficult to detect than ballistic missiles, both in flight and when they are stored, handled, uploaded or downloaded, and

deployed. The Soviets repeatedly voiced these arguments against cruise missile development--in which they actually trailed the United States--at the arms control bargaining table. See William H. Kincade, "Arms Control: Negotiated Solutions," in *Cruise Missiles*, ed. Betts, 322-329.

[64]MccGwire, "The Tomahawk and General Purpose Naval Forces," in *Cruise Missiles*, ed. Betts, 250-251.

[65]Author's personal knowledge of the Navy's Cold War-era Maritime Strategy, acquired during a 1987-1990 tour in the Fleet Ocean Surveillance Information Center Detachment, Commander in Chief U.S. Atlantic Fleet (FOSIC DET CINCLANTFLT). Corroborating commentary may be found in John Hattendorf, "The Evolution of the Maritime Strategy, 1977 to 1987," *Naval War College Review*, Summer 1988, 7-28.

[66]This common view is summarized by John C. Toomay, "Technical Characteristics," in *Cruise Missiles*, ed. Betts, 48-49; and MccGwire, "The Tomahawk and General Purpose Naval Forces," in *Cruise Missiles*, ed. Betts, 268-269.

[67]Robert J. Art and Stephen E. Ockenden, "The Domestic Politics of Cruise Missile Development, 1970-1980," in *Cruise Missiles*, ed. Betts, 408.

[68]Tomahawk effectiveness in hitting DESERT STORM targets has been assessed at anywhere between 41 and 98 percent. The high figure was published immediately after the Gulf War--according to the GAO 1997 Report, at the urging of the manufacturer, McDonnell Douglass. That figure was revised downward in the GAO 1997 Report, and was reported in both the 1997 Report and GAO's 1995 Report on cruise missiles, as "approaching" the success rate of ordnance delivered by manned aircraft. The 1997 report effectively places this figure between 60 and 70 percent. Officially the report estimates a hit success rate of between 55 and 80 percent for the F-117, which struck targets in the most target categories of any weapon system used in the war. However, review of the specific video-corroborated reports of F-117 hits reveals a rate of 68 percent. GAO analysts preferred not to give this rate official validation due to difficulties in attributing hits to individual weapons in the BDA process. However, a success rate of 70 percent accords with the author's experience as a recipient of unclassified briefs on TLAM hit rate in the Gulf; thus, the range of 60 to 70 percent is used in this thesis. (GAO 1997 Report, 1, 128-131.)

[69]The categories are: Air defense/SAM; Nuclear/Biological/Chemical capability; SCUD missile systems (a separate target category in DESERT STORM); Command/ Control/Communication (C3); Electrical power; Oil (Petroleum/Oil/Lubricants--POL, including national infrastructure); Lines of communication, Offensive counter-air, Naval, Government centers, Military industrial base facilities (e.g., equipment garrison and assembly points, warehouses, and manufacturing), and Ground order of battle (that is, Iraqi ground forces deployed in tactical formation). The DESERT STORM joint target

list ultimately had 476 total targets, of which TLAMs were used against thirty-eight. GAO 1997 Report, 49-51.

[70]GAO 1997 Report, 197.

[71]This paragraph's synthesis of lessons on unique TLAM contributions is derived from the GAO 1995 Report on cruise missiles, the GAO 1997 Report, and Robin Ranger et al., "Cruise Missiles: New Threats, New Thinking," *Comparative Strategy*, Summer 1995, 255-275.

[72]GAO 1995 Report, 38.

[73]GAO 1997 Report, 197.

[74]Ibid.

[75]GAO 1997 Report, 150.

[76]GAO 1997 Report, 198.

[77]This history is referenced in numerous writings on the Gulf War and command and control warfare, such as C. Kenneth Allard, "The Future of Command and Control: Toward a Paradigm of Information Warfare," in L. Benjamin Ederington and Michael J. Mazarr, eds., *Turning Point: The Gulf War and U.S. Military Strategy* (Boulder, CO: Westview Press, 1994), 162. The scope and extent of U.S. plans to disrupt Soviet C2 during a superpower conflict are personally known to the author due to the Cold War-era tour at FOSIC DET CINCLANTFLT previously referenced.

[78]GAO 1997 Report, 203.

[79]Joint Pub 3-0, A-2; and Field Manual (FM) 100-5, *Operations* (Washington, D.C.: Department of the Army, June 1993), 2-5, 2-13.

[80]This assessment, valid for DESERT STORM, has changed in the years since the war due to improvements to the Tomahawk weapon system. TLAM has not achieved the responsiveness and low surveillance overhead of ATACMS, but it can be accurately targeted now with far less manpower-intensive sensor information and iterative computerized analysis than was the case during the Gulf War. Primary among the TLAM upgrades responsible for this is the incorporation of GPS precision guidance.

[81]See, for example, Amy Truesdell, "Cruise Missiles: the Discriminating Weapon of Choice?" *Jane's Intelligence Review*, February 1997, 87-90; and Duncan Lennox, "Cruise: A Missile for the '90s," *Jane's Defence Weekly*, 7 May 1994, 19-20.

[82]John Pike, "Operation DELIBERATE FORCE," [article on-line], Federation of American Scientists Military Analysis Network, 3 March 1998; available from http://www.fas.org/man/dod-101/ops/deliberate_force.htm; Internet; accessed 3 January 1999. Also John A. Tirpak, "Deliberate Force," *Air Force Magazine* October 1997 [magazine on-line]; available from http://www.afa.org/magazine/1097deli.html; Internet; accessed 3 January 1999.

[83]Craig Covault, "Precision Missiles Bolster NATO Strikes," *Aviation Week & Space Technology*, 18 September 1995, 22-23. This article's report is confirmed by the author's personal knowledge of DELIBERATE FORCE from participation at the NATO Commander in Chief's (CINCSOUTH's) headquarters and the headquarters of Commander, Submarine Group Eight, which provided TLAM planning support for the operation.

[84]See Robert C. Owen, "The Balkans Air Campaign Study," 45-47.

[85]Bombing continued unabated on 11 September, but most missions were cancelled on 12 and 13 September due to bad weather. The Serbs agreed to NATO cease-fire terms on 14 September. See Tirpak for a chronicle of events after the TLAM strike.

[86]Tirpak, 5.

[87]Tirpak, 6; and Craig Covault, "NATO Air Strikes Target Serbian Infrastructure," *Aviation Week & Space Technology*, 11 September 1995, 27.

[88]FM 100-5, 2-6. The five tenets of Army operations are initiative, agility, depth, synchronization, and versatility.

[89]Karl von Clausewitz, *On War* (Princeton: Princeton University Press, 1976), 87.

[90]Primary material for this strike comes from Timothy F. Sparks, "The Dawn of Cruise Missile Diplomacy"; and David A. Fulghum, "Clashes with Iraq Continue after Week of Heavy Air Strikes," *Aviation Week & Space Technology*, 25 January 1993, 38-39.

[91]Note: this chapter refers to the U.S.-led coalition in Southwest Asia, post-DESERT STORM, with a lower-case "c" to distinguish it from the much larger Coalition of nations which joined to prosecute the 1991 war.

[92]Sparks, 20-23. Sparks summarizes reactions reported in the popular press, with the most vituperative being that of Simon Edge in "Saddam Survives Parting Shot; George Bush's Campaign Against Saddam Hussein During His Last Days in Office," *MEED Middle East Business Weekly*, 37, no. 4 (1993). *The Economist*, while less overtly hostile, attributed the strike primarily to a clumsy U.S. effort to revive the flagging spirits of the coalition by sending a "message" to Saddam. See notes (96 and 97) below.

[93]Sparks, 23.

[94]Dan McKinnon, *Bullseye Iraq* (New York: Berkley Books, 1987), 102.

[95]Conversino, "The Changed Nature of Strategic Air Attack," 28-41.

[96]Sparks summarizes this reaction on pp. 21-22. The opinion of *The Economist* ("A Missile too Many?" 23 January 1993, 37-38) was representative.

[97]"A Missile too Many?," 37.

[98]Fulghum, 42.

[99]DOD information reported in Fulghum, 42.

[100]See U.S. Joint Chiefs of Staff, Joint Intelligence Support to Targeting Operations (Joint Pub 2-01.1) [publication on-line]; available from: http://delphi-s.dia.smil.mil/intel/j2/j2t/issues/DOCTRINE/2-01.1; SIPRNET (restricted access); last accessed 07 May 1999.
Joint Pub 2-01.1 derives its baseline targeting doctrine from Joint Pub 3-0 (Doctrine for Joint Operations) and U.S. Air Force, An Introduction to Air ForceTargeting (AFP 200-17) (Washington, DC: U.S. Air Force,1998).

[101]Such exercises include UNIFIED ENDEAVOR, Joint Task Force Exercises (JTFEXs) for deploying naval battle groups, and RED FLAG/BLUE FLAG exercises. Until adopting the procedures of Joint Pub 2-01.1 (published in 1997), ACOM encouraged the use of its own attritional combat assessment models in joint force targeting training. The author had experience with these models in several joint exercises during the period 1995-1997. The doctrine solidifed in Joint Pub 2-01.1 affirms the continuing validity of attritional models in U.S. thinking about the campaign process.

[102]Definition of decisive point from FM 100-5, 6-7.

[103]Sparks, 25-27.

[104]Sparks, 26.

[105]Ibid.

[106]Sparks, 29-30, summarizes opinion from popular and professional commentators on the strikes, including *Jane's Defence Weekly* reporters and Vice Admiral William H. Rowden (Ret.), quoted in Nicholas Sabalos, Jr., "Weapon of Choice: Surface Warfare Strikes!," *Surface Warfare*, September/October 1993, 3.

[107]Brian Duffy, "Back to Iraq: Desert Strike," *U.S. News & World Report*, 16 September 1996, 34-44.

[108]Barbara Starr, "Clinton's Line in the Sand puts Pressure on DOD," *Jane's Defence Weekly*, 11 September 1996, 4. The northern boundary of the southern NFZ was shifted from 32N to 33N.

[109]Cited in Sparks, 40.

[110]"Hit and Miss . . .", *National Review*, 30 September 1996, 14.

[111]Sparks, 41.

[112]Sparks, 38.

[113]David A. Fulghum, "Secrecy about Raids Hints more to Come," *Aviation Week & Space Technology*, 31 August 1998, 30-32.

[114]This unusual reticence by the President was remarked by both Fulghum and Richard J. Newman in "America Fights Back," *U.S. News & World Report*, 31 August 1998, 38-46. Although there was speculation that the President's comparative silence was related to his impeachment proceeding, he did not show a similar reluctance to stump for his later strikes on Iraq in December 1998, when the impeachment issue was at an even higher pitch. An alternative explanation might be that his advisors considered it prudent to minimize his public rhetoric for an attack on terrorist facilities, wishing to reduce the likelihood of making him a particularly desirable target because of the psychological impact of trenchant and challenging public statements. This would have the merit of also explaining why administration sources put out so little information on the strikes, compared to that released about previous missile attacks.

[115]Fulghum, 30.

[116]Fulghum, 30; Berger quoted in Russell Watson and John Barry, " 'Our Target was Terror,'" *Newsweek*, 31 August 1998, 24.

[117]Watson and Barry summarize a portion of the convoluted analytical trail leading to the Afghan terrorist training facilities (26-27). There has been widespread criticism of the strike on the Sudanese chemical factory, which open sources suggest was a legitimate plant with no actual ties to the bin Laden organization; criticism which the U.S. government has not responded to with sufficient detail for an informed judgment.

[118]Watson and Barry, 24.

[119]Newman, 46.

[120]Fulghum, 31.

[121]Russell W. Glenn, "No More Principles of War?" *Parameters*, Spring 1998, 48.

[122]William T. Johnsen, et al., *The Principles of War in the 21st Century: Strategic Considerations* (Carlisle Barracks, PA: U.S. Army War College Strategic Studies Institute, 1995), iii.

[123]Johnsen et al., 16

[124]Ibid.

[125]Primary sources for this summary are Admiral U.S.G. Sharp (Ret.), *Strategy for Defeat: Vietnam in Retrospect* (Novato, CA: Presidio Press, 1978), 96-104; and H. R. McMaster, *Dereliction of Duty: Lyndon Johnson, Robert McNamara, the Joint Chiefs of Staff, and the Lies that Led to Vietnam* (New York: HarperCollins, 1997), 62-63 and 72-85. Numerous citations from McMaster indicate the widespread agreement of military commentators on the incremental, attritional, and ineffective character of the Vietnam bombing campaigns in the 1960s.

[126]Sharp, 3-4.

[127]McMaster, 62.

[128]McMaster, 156.

APPENDIX

The Principles of War

Economy of force. The purpose of economy of force is to allocate minimum essential combat power to secondary efforts. Economy of force is the judicious employment and distribution of forces. It is the measured allocation of available combat power to such tasks as limited attacks, defense, delays, deception, and even retrograde operations in order to achieve mass elsewhere at the decisive point and time.

Maneuver. The purpose of maneuver is to place the enemy in a position of disadvantage through the flexible application of combat power. Maneuver is the movement of combat forces in relation to the enemy to secure or retain positional advantage, usually in order to deliver--or threaten delivery of--the direct and indirect fires of the maneuvering force. Effective maneuver keeps the enemy off balance and thus also protects the friendly force. It contributes materially in exploiting successes, preserving freedom of action, and reducing vulnerability by continually posing new problems for the enemy.

Mass. The purpose of mass is to concentrate the effects of combat power at the place and time to achieve decisive results. To achieve mass is to synchronize appropriate joint force capabilities where they will have decisive effect in a short period of time. Mass must often be sustained to have the desired effect. Massing effects, rather than concentrating forces, can enable even numerically inferior forces to achieve decisive results and minimize human losses and waste of resources.

Objective. The purpose of the objective is to direct every military operation toward a clearly defined, decisive, and attainable objective. The objective of combat operations is the destruction of the enemy armed forces' capabilities and will to fight. Objectives must directly, quickly, and economically contribute to the purpose of the operation. Each operation must contribute to strategic objectives.

Offensive. The purpose of an offensive action is to seize, retain, and exploit the initiative. Offensive action is the most effective and decisive way to attain a clearly defined objective. Offensive operations are the means by which a military force seizes and holds the initiative while maintaining freedom of action and achieving decisive results. The importance of offensive action is fundamentally true across all levels of war.

Security. The purpose of security is to never permit the enemy to acquire unexpected

132

advantage. Security enhances freedom of action by reducing friendly vulnerability to hostile acts, influence, or surprise. Security results from the measures taken by commanders to protect their forces. Staff planning and an understanding of enemy strategy, tactics, and doctrine will enhance security. Risk is inherent in military operations. Application of this principle includes risk management, not undue caution. Protecting the force increases friendly combat power and preserves freedom of action.

Simplicity. The purpose of simplicity is to prepare clear, uncomplicated plans and concise orders to ensure thorough understanding. Simplicity contributes to successful operations. Simple plans and clear, concise orders minimize misunderstanding and confusion. When other factors are equal, the simplest plan is preferable. Simplicity in plans allows better understanding and execution planning at all echelons. Simplicity and clarity of expression greatly facilitate mission execution in the stress, fatigue, and other complexities of modern combat and are especially critical to success in combined operations.

Surprise. The purpose of surprise is to strike the enemy at a time or place or in a manner for which it is unprepared. Surprise can help the commander shift the balance of combat power and thus achieve success well out of proportion to the effort expended. Factors contributing to surprise include speed in decisionmaking, information sharing, and force movement; effective intelligence; deception; application of unexpected combat power; OPSEC; and variation in tactics and methods of operation.

Unity of command. The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective. Unity of command means that all forces operate under a single commander with the requisite authority to direct all forces employed in pursuit of a common purpose. Unity of effort, however, requires coordination and cooperation among all forces toward a commonly recognized objective, although they are not necessarily part of the same command structure. Unity of effort--coordination through cooperation and common interests--is an essential complement to unity of command.

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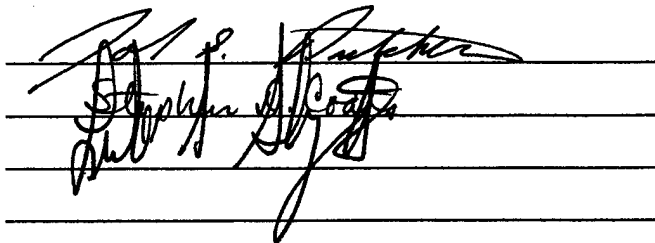# CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT

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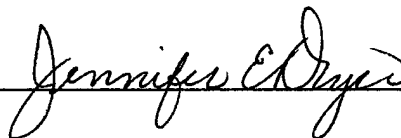
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